AUTOMATED METHOD AND SYSTEM FOR RECOGNIZING UNFULFILLED OBLIGATIONS AND INITIATING STEPS TO CONVERT SAID OBLIGATIONS TO A FULFILLED STATUS OR TO A NULL STATUS FOR RESALE

BACKGROUND OF THE INVENTION

1. Field of the Invention

The invention relates to automatic identification of unticketed reservations stored in a database, which reservations are required to be ticketed according to certain criteria, the invention automatically noticing a reservation-generating entity at least once of the ticketing requirement and canceling the reservation according to certain criteria if a ticket is not issued for the reservation according to the criteria, the invention further being capable of functioning remote from the database and reservation-generating entity.

2. Description of the Prior Art

Certain time-sensitive services which are reserved by one or more reservations entities must be used as of a date certain or else the opportunity of the service provider to benefit from the reservation is forever lost. A particular example can be found in the airline industry where reservations are made by travel agents, flight packagers, various booking agents and even an airline itself, the reservations being maintained in a central reservation system which is effectively a database which can be accessed from remotely of the database. The airline in this situation is the service provider and stands to lose appreciable monies if reservations booked into the central reservation system are not ticketed prior to the service to be provided, that is, a particular flight. It is imperative that a reservation which is not going to be ticketed be removed from the central reservation system well before the service, that is the flight, so that the seat can be sold to a user who will actually buy a ticket and sit in the reserved seat.

For various reasons, some passengers abuse reservations systems by making speculative reservations either in their own names or in fictitious names. Often, multiple reservations are made

by one person for a given flight with an outcome often being that none of the reservations are actually used. In order to combat such practices by the public, airlines in particular often resort to overbooking of a flight in order to increase the load factor on flights which are ostensibly sold out. Airlines in particular wish to guard against situations wherein a flight is sold-out prior to the day of departure and yet departs with empty seats. In such situations, revenue is forever lost especially in view of the likely fact that customers wishing to buy a seat were turned away since seats were apparently no longer available. In essence, the reduction of no-show factors on sold-out flights or the like increases revenue. Revenue can also be increased on flights which are not sold out by the practice of "flight firming", that is, periodically checking flight reservations or the like in a central database to determine whether each reservation has been ticketed as of a certain date and time determined according to a given set of criteria. According to these criteria, a notice may be forwarded to the ticketing entity responsible for the reservation and noting that a ticket must be noted in the database prior to a certain time, else the reservation will be canceled so that the reservation can be resold. Removal of non-ticketed reservations of an airline removes speculative reservations or bookings from flight inventories and provides an opportunity to reserve the seat anew in the name of a ticket-buying passenger.

Simplified flight firming has previously been conducted manually especially once a flight has become extremely overbooked or during peak travel periods when overbooking is common. However, manual flight firming is a labor intensive effort which is expensive and difficult to manage. In essence, manual flight firming involves the checking visually of a printout of reservations contained in a central reservations system with each reservation being checked to determine if the reservation has been ticketed. For those reservations which have not been ticketed and which do not fit into a given set of parameters which would excuse the non-ticketing, the manual flight firmer must then contact the reservations issuing agency such as a travel agency or the like

with the information that the reservation will be canceled if a ticket is not issued by a certain date. Manual follow-up is necessary in order to determine if the ticket has been issued and, if not, a second notice may be provided depending upon another set of criteria.

Ticketing time limit rules can be set by using flight number, origin, destination, booking class, departure date, booking date, passenger type code, point of sale, Frequent Flier number, global distribution system or GDS requirements, and other special instructions (OSI), messages or any combination thereof. Flexibility of this nature allows air carriers to segment very small portions of each passenger name record or PNR for specialized flight firming to allow for contract fares, wholesalers, consolidators, and numerous other special situations.

Flight firming according to the invention can be automatically carried out from a remote location. Flight firming can be continuously accomplished to enforce ticketing time limits and to maintain flight inventories free of speculative bookings, thereby resulting in lower no-show percentages, lower spoilage in revenue spill and higher onboard load factors on sold-out flights in particular. Flight firming according to the invention can also automatically remove speculative bookings made under assumed names and remove multiple bookings and the like while applying special ticketing requirements to certain accounts, reservations entities or individuals based on criteria including the amount of business previously provided for the holder of the reservation.

While the automated and remotely operable system of the present invention can be utilized other than will be explicitly described herein, it is to be understood that the present methodology and system operates particularly well for the practice of "flight firming" as will be described hereinafter.

SUMMARY OF THE INVENTION

In a preferred embodiment, the invention provides an automated method and system capable of operation from a remote location for identifying date-sensitive entries in a database wherein an obligation is to be satisfied relative to each entry according to instructions provided by the

beneficiary of the obligation. In a particular application of the present automated method and system, use within an airline's reservations system is contemplated with the present method and system through connection to a central reservation system identifying individual passenger name records which have not been ticketed and which must be ticketed by a date certain according to pre-established ticketing time limit instructions. On identification of a ticketless reservation, notice is forwarded by the present method and system to a ticketing entity which is responsible for establishment of the reservation, this notice including a demand that a ticket be issued by a certain time according to instructions provided to the automated system of the invention. The present method and system can further be configured to issue more than one notice in the event that a reservation is not ticketed, particular reservations being handled according to the ticketing time limit instructions. These instructions further determine whether or not the reservation is to be canceled in the even that the reservation does not become ticketed by a certain date. In this way, certain classes of reservation holders, such as contract reservations, special frequent flier reservations, etc. will not be canceled even though notices may or may not be forwarded depending upon the ticketing time limit instructions provided by the airline for which the services are provided.

The foregoing is generally referred to in the airline industry as "flight firming" and has as particular objectives the enforcement of ticketing time limit instructions or rules on entities which issue reservations and/or tickets such as travel agencies and the like. A further intent of the process of "flight firming" is the reduction of lost revenue from speculative bookings, the reduction of no-shows and oversales and an increase of onboard load factors on sold-out flights. The ticketing time limit rules can be configured to provide the ability for enforcement based on class, market, origin/destination city, ARC/IATA, booking country, booking date, departure date, etc. or any combination thereof. Flight firming can be conducted at a remote location and can be automated to run twenty-four hours a day, seven days a week, with maximum "up-time" in order to ensure that

flights are continually firmed. Removal of non-ticketed reservations from a central reservations system not only removes speculative bookings from flight inventories and global distribution system invoices, the removal also provides the opportunity for reselling of the seat to a person who actually intends to utilize the flight service. Flight inventories are therefore rendered free from speculative bookings with resulting decreases in no-show percentage, lower spoilage and revenue spill, and higher onboard load factors on sold-out flights.

The present automated method and system operates to produce flight firming with two robotic applications, a set of robots operating on a set schedule to review flight inventories for any previously unseen passenger name record or PNR. The system recalls each PNR which has previously been seen and only identifies and takes action relative to a new PNR, thereby reducing the time necessary for accomplishment of the function as well as reducing needless churning through a reservations system. When a new PNR is found, the robot determines if the PNR qualifies for a ticketing time limit set of rules or TTL, these rules being based on carrier-set flight firming parameters. The robot then applies the proper TTL to the PNR and sends a message to the booking agent responsible for the PNR requesting a ticket number by the date/time of the TTL if the reservation is not shown to be ticketed. The message is appended to the PNR as forwarded to the booking agent and is sent to a message queue at the office of the booking agent. Accordingly, a high assurance is provided that the TTL message will be received and actioned by the booking agent. Once the message is sent, the robot logs the time of expiration of the TTL internally.

A log created by the first robot is worked by a second robot to query all PNRs after expiration of respective TTLs. If the second robot finds a ticket number, the PNR is logged as ticketed and the robot moves on. If no ticket number is found, the second robot actions the PNR as per the flight firming parameters of the carrier. A carrier sets rules for the TTL and for operation by the second robot in the event of a ticketless reservation even after expiration of the TTL by any set

of desired standards, these rules providing flexibility which allows carriers to segment any desired portion of their particular PNRs for specialized flight firming and to allow for contract fares, wholesalers, consolidators and numerous other "special situations."

The flight firming function is configured to accept any airline ticket stock or, in the alternative, to accept only ticket stock from those carriers with whom a particular carrier has an Interline T&B Agreement. Further, a database of previously accepted ticket numbers can be maintained so that a rejection can be made of any ticket number "previously seen" which may be provided in new PNRs. Duplicate ticket numbers can therefore be checked by the present system. Special handling can be provided by assigning special TTLs to wholesalers, corporate accounts or reservations denoting a certain status of frequent flier account or other special situation as desired.

The second robot employed in the flight firming process can check PNRs before the TTL expires and send a second request prior to TTL expiration if a ticket number is not found. Multiple requests can therefore be made of the ticketing agency.

Customized flight firming scheduling can be provided based upon a carrier's booking curve such that work can be concentrated within the next ninety days of each day with firming within a time period from ninety to three hundred thirty days once a week, as an example. A period of high traffic can be firmed once a week from three hundred thirty days to one hundred eighty days prior to the high traffic period and then daily from one hundred seventy-nine days up through flight date, as an example. Seats thus can be caused to remain available for sale closer to the flight departure date to more effectively reduce no-shows and to provide maximum beneficial load factor.

The method of the invention documents all automated flight firming process operations when working the flights of a given carrier. A copy is made of each new PNR before messaging the PNR, therefore providing the ability to create a PNR database useful for management of customer relations. Further, the present method logs every entry which the robots make in the PNR, as well as

responses from the global distribution system or GDS. Another copy is made of the PNR when checking for a ticket number, the foregoing documentation being essential to assuring that questions can be answered as to when and why certain steps were taken, such as cancellation of the reservation, and also alleviates any basis for dispute over how a given PNR was processed.

Still further, management reports can be generated daily and monthly in addition to the logs to advise of flight firming activity. A daily report can summarize the number of PNRs worked the previous day, how many PNRs were assigned TTL requests, how many second warnings were issued and how many PNRs were canceled by agencies and by the present system. A database can also be created from canceled segments with creation of standard reports which illustrate cancellations by city pair, class of service and AITA/ARC number.

The present method and system provides a further robot or robotic application which searches first past logs looking for fictitious names in all of the new PNRs which are seen within a given period of time, an existing database of fictitious names created from BIDT audits inter alia are used to identify attempts to create a PNR with a fictitious name. While action may not be taken relative to such PNRs by the present system, these results can be daily communicated to a carrier such as by email or the like.

Similarly, a robotic application searches PNRs for duplicate flight segments and weeds out duplicate bookings by sifting through connections and similar cities. This robotic application can be customized to handle waitlists clearance from coach to premium class and waitlists clearance within a cabin from a higher to a lower fare of class. Additionally, duplicates so discovered can be canceled or queued as desired.

The present system can operate in concert with other systems which identify "passive" bookings, the issuance of e-tickets or processing of airline teletype reject queues.

Accordingly, it is a primary object of the invention to provide an automated method and system for identifying date-sensitive entries in a database wherein an obligation must be satisfied relative to the entry according to instructions provided by the beneficiary of the obligation.

It is another object of the invention to provide an automated method and system operable from a remote location for applying the present automated method and system to airline flight firming processes so that unticketed reservations maintained in a reservations system for a time prior to issuance of a ticket to "firm" the reservation to a ticketed status can be scrutinized by the present system to determine whether ticketing time limit rules established by a carrier have been adhered to with messages being forwarded to the reserving entity noticing the need for issuance of a ticket for a given PNR.

It is a further object of the invention to provide an automated method and system operable from a remote locate which is capable of enforcing ticketing time limit rules on travel agency reservations and the like in order to reduce lost revenue from speculative bookings, to reduce no shows and oversales, to increase onboard load factors on sold-out flights and to enforce complex ticketing time limit rules based on a variety of factors set by a particular service provider such as an airline carrier.

Further objects and advantages of the invention will become more readily apparent in light of the following detailed description of the preferred embodiments.

BRIEF DESCRIPTION OF THE DRAWINGS

FIGURE 1A is a diagrammatical representation of a generalized system according to the invention illustrating operational interrelationships of the component parts of the system as well as operations of said component parts;

FIGURE 1B is a diagrammatical representation of a particular embodiment of the invention and having general representations of the several coordinated program features;

FIGURE 2 is a diagrammatical representation illustrating organization of data flow within the system of the invention and is referenced to Table I in the specification;

FIGURE 3 is a diagrammatical representation of the sequences of operations involving queues which occur in operation of the present system;

FIGURE 4 is a flow chart illustrating robot startup operations within the present system;

FIGURE 5 is a diagrammatical representation of scheduling operations within the present system;

FIGURE 6 is a flow chart illustrating the operation or running of the present system;

FIGURE 7 is a flow chart illustrating operational sequences whereby the system prepares to obtain PNRs;

FIGURE 8A is a flow chart illustrating sequences and operations by which the present system obtains PNRs;

FIGURE 8B is a diagrammatical representation of an operational portion of the present system whereby new PNRs are identified and checked for expired TTLs;

FIGURE 9A is a flow chart illustrating operational sequences relative to the identification of new PNRs;

FIGURE 9B is a diagrammatical representation related to Figure 9A relative to first round processing of PNRs;

FIGURE 10 is a flow chart illustrating first round flight firming processes;

FIGURE 11 is related to Figure 10 and provides further illustration of first round flight firming;

FIGURE 12 is related to Figures 10 and 11 and provides further operational information relative to first round flight firming;

FIGURE 13 is a flow chart illustrating operational sequences of the system which check for suspicious names;

FIGURE 14 is related to Figure 13 and provides additional information relative to checking of suspicious names;

FIGURES 15, 16 and 17 are related flow charts which allow for checking of duplicate segments;

FIGURE 18 is a flow chart illustrating the checking of a passenger name record or PNR for existing ticket number(s);

FIGURE 19 is a flow chart illustrating operational sequences of the present system for checking for duplicate ticket numbers;

FIGURE 20 is a flow chart illustrating operational sequences relating to checking passenger name records or PNRs for expired ticketing time limit conditions;

FIGURES 21, 22 and 23 are flow charts illustrating second round flight firming including operational sequences attendant thereto;

FIGURE 24 is a diagrammatical representation of operational sequences of the invention intended for building a database of cancelled passenger name records or PNRs;

FIGURE 25 is a diagrammatical representation of operational sequence routines necessary for establishing top-of-day routines; and,

FIGURES 26, 27 and 28 are flow charts illustrating operational sequences related to passenger name record or PNR scraping.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

The methodology of the invention is best carried out with the use of and the system of the invention best comprises commercially available computer apparatus such as that referred to as a personal computer or PC as is manufactured and marketed by International Business Machines.

Computer apparatus compatible with such products of IBM, such as Compaq Personal Computers, may also comprise apparatus particularly useful in creation of the system of the invention. Such apparatus can conveniently use an operating system such as Microsoft Windows and particularly Windows NT and Windows 2000. Novell Networking may also be used satisfactorily. It is to be understood that computing apparatus of other manufacture can be operable to produce the functions of the present methodology and to comprise the present system whether or not used within the preferred operating system environment.

Referring now to Figure 1, a process flow diagram is shown of a flight firming module represented generally by the numeral 10 as comprising the general process of a system referred to herein and in the business operations of the assignee for convenience as Predator, a trademark of the assignee. The term Predator is representative of a family of modules and robotic applications useful for performing the functions herein described, this family of modules and robotic applications having been developed by the assignee for performing the methodology of the invention. As can be seen from the process flow diagram of Figure 1, identification is made at 12 of a travel agency booking, for example, in a host system. The element designated as 12 in Figure 1 also represents a travel agency or other reservation booking entity capable of booking a passenger name reservation or PNR into a host system such as a central reservation system or CRS. A PNR can be booked into the CRS by the travel agency or similar entity with a ticket number attached to the PNR or a ticket number may be later attached to the PNR. Search is made at 14 relative to the PNR identified at 12 in order to determine whether the PNR has a ticket number. In the event that a ticket number is found at 16, the ticket number is moved into a ticketing field whereby the PNR is identified as being "ticketed" and is no longer a concern to operation of the present system. In the event that a ticket number is not found at 18, the module 10 of the invention sends an OSI request to the agency which made the reservation requesting that a ticket be issued and a ticket number provided as per ticketing

time limit rules or TTL as have been established by a carrier according to flight firming parameters which the carrier wishes to impose. The OSI request is referable to other special instructions which are provided to the reservation issuing agency, the instructions primarily relating to the need for ticketing of the reservation by a date certain in order to prevent cancellation of the reservation. These functions occur at 20 along with logging of the activity in the host PNR.

Assuming that the TTL expires at 22, a check is then further made at 24 of the PNR previously identified in order to determine whether this PNR has been provided with a ticket number, the system being capable of validating according to predetermined requirements. In the event that a ticket number has not been issued for the PNR as noted at 26, the process of notification can be repeated through the functionality shown at 20 according to the TTL codes which have been chosen by the particular carrier. When a ticket number has not been found at 26, requirements imposed on the system by the carrier can cause immediate cancellation of the PNR or queuing of the PNR according to carrier requirements.

In the event that the check at 24 results in location of a ticket number as represented at 28, then the reservation is considered complete as at 30 and the ticket number is moved into a ticketing field.

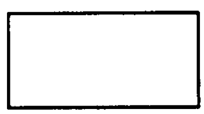
Particular importance is attached to the functionality at 12 wherein the PNR is first identified. A robotic or robotic application, known herein as Sweeper, a proprietary term of the assignee, operates on a set schedule and identifies from flight inventories those PNRs which have not been seen previously. Accordingly, PNRs which have been seen previously are not analyzed since such analysis is prevented by a "traffic cop" function which prevents repeat analysis of PNRs, thereby reducing time necessary to process flight inventories as well as reducing needless churning through a reservation system. The robot Sweeper therefor only identifies for action a new PNR at which time it is determined whether the new PNR qualifies for a TTL based on carrier-set flight firming

parameters. The process generally shown in the flow diagram of Figure 1 then proceeds as described.

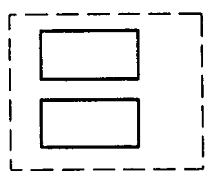
A second robotic application known as Enforcer, a term proprietary to the assignee, works off of the log created by Sweeper at 20 and queries PNRs after the expiration of the TTL as represented at 22. The robotic application Enforcer thus provides those functions enumerated thereafter in the process flow diagram of Figure 1.

Reference will now be made to Figures 2 through 34 and to tables provided hereinafter in order that the particulars of the present methodology and system can be appreciated. For the sake of convenience, it is necessary to utilize specific terms which are defined in tabular form hereinafter.

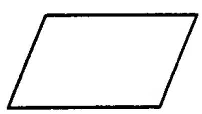
Symbols and line types used in the drawings are as follows:



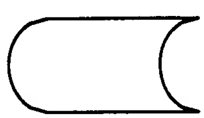
Process, Function, or Device



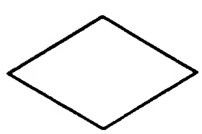
Several Functions in a Process



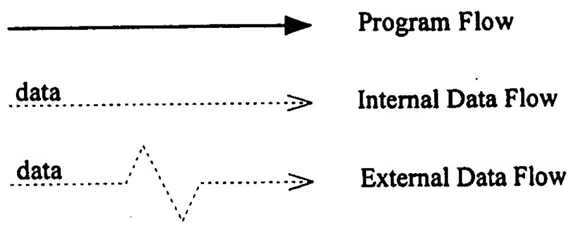
Data



On-Line Storage (File)



Decision Point



Referring now to Figure 2, a representation is made of data flow processing from an .INI file at the upper left-hand corner of Figure 2 to a VALIDPNR File at the lower, central portion of Figure 2. Figure 2 is to be interpreted in view of Table I as follows:

TABLE I

Queue Name	Meaning
LDP	List Display Parameters
LDO	List Display Output
LDI	List Display Input
CP	Candidate PNRs
FRI	First-Round Input
FRO	First-Round Output
SRI	Second-Round Input
SRO	Second-Round Output

A typical .INI File entry for robots of the XAL example family are to be seen in Table II and Table III. It is to be understood that numerous entries can be contained in the actual .INI files of such a robot.

TABLE II

Typical .INI File
Robot XAL01

```
XAL01.INI file:
[Config]
Wssize=40M

Initial workspace=24 ROBOT
Responsiveness=200

[Robot Settings]
RUN LD BATCH SIZE=300
FIRST ROUND BATCH SIZE=100
SECOND ROUND BATCH SIZE=100

CPROCESS1=PROC_TRAFFIC_COP
CPROCESS2=PROC_RUN_LDS
CPROCESS3=PROC_FIRST_ROUND
CPROCESS4=PROC_SECOND_ROUND
CPROCESS5=PROC_BUILD_LDS

TPROCESS1=Top_Of_Day
TPROCESS1-MON TIME=00:01
TPROCESS1-TUE TIME=00:01
TPROCESS1-WED TIME=00:01
TPROCESS1-THU TIME=00:01
TPROCESS1-FRI TIME=00:01
TPROCESS1-SAT TIME=00:01
TPROCESS1-SUN TIME=00:01

TPROCESS2=PROC_SCHED_LDS'DAILY
FULL SCAN'
TPROCESS2-MON TIME=08:00
TPROCESS2-TUE TIME=08:00
TPROCESS2-WED TIME=08:00
TPROCESS2-THU TIME=08:00
TPROCESS2-FRI TIME=OFF
TPROCESS2-SAT TIME=11:00
TPROCESS2-SUN TIME=11:00
DAILY FULL SCAN-MON=0 60
DAILY FULL SCAN-TUE=0 60
DAILY FULL SCAN-WED=0 60
DAILY FULL SCAN-THU=0 60
DAILY FULL SCAN-FRI=0 60
DAILY FULL SCAN-SAT=0 60
DAILY FULL SCAN-SUN=0 60
```

TABLE III

Typical .INI File
Robot XAL02

```
XAL02.INI file:

[Config]
Wssize=40M

Initial workspace=24 ROBOT
Responsiveness=200

[Robot Settings]
FIRST ROUND BATCH SIZE=100
SECOND ROUND BATCH SIZE=100

CPROCESS1=PROC_BUILD_LDS
CPROCESS2=PROC_RUN_LDS
CPROCESS3=PROC_FIRST_ROUND
CPROCESS4=PROC_SECOND_ROUND

TPROCESS1=EMAIL_SUSPICIOUS_NAMES
TPROCESS1-MON TIME=00:01
TPROCESS1-TUE TIME=00:01
TPROCESS1-WED TIME=00:01
TPROCESS1-THU TIME=00:01
TPROCESS1-FRI TIME=00:01
TPROCESS1-SAT TIME=00:01
TPROCESS1-SUN TIME=00:01

TPROCESS2=ADD_CANCELS_TO_DB ''
TPROCESS2-MON TIME=00:02
TPROCESS2-TUE TIME=00:02
TPROCESS2-WED TIME=00:02
TPROCESS2-THU TIME=00:02
TPROCESS2-FRI TIME=00:02
TPROCESS2-SAT TIME=00:02
TPROCESS2-SUN TIME=00:02
```

Referring also to Figure 3, sequences of operations involving queues built according to the present methodology are illustrated, the definitions of terms found in Figure 3 being herein provided.

For the sake of simplicity and convenience, terms and abbreviations herein employed are provided in tabular form in Tables XIV through XX appended to the end of this specification immediately before the Claims section of this application. Definitions of terms herein employed are provided. It is to be understood that at least certain of these definitions will have been provided at other locations within the present specification.

Processes necessary for starting and running a robot for accomplishment of flight firming is now provided along with definition of terms so employed. Particular reference is made to Figures 4 through 6 relative to robot start-up, scheduling and running, these drawings being linked as indicated in the drawings themselves and in tabular form provided hereinafter.

A robot according to the invention is a single instance of APL, that is, A Programming Language, running on a PC or personal computer and driven by a unique .INI file which describes the processes to be run by the robot. The APL language is inherently efficient and effective for the processes herein provided due to orientation of this language toward mathematics and logic. More than one robot can be used for a given customer family and for as many processes as are necessary. However, each robot serves only one customer. Each robot further runs on a particular personal computer and several robots can be run simultaneously on the same computer. As an example of an actual system configuration, the use of two servers can be chosen which are assigned as storage for the robots. An H server can contain the robots per se while an I server contains reports and logs produced by the robots. As an example, for a customer known as Example Air Line, the family would be identified as "XAL", the first robot then being XAL01, the second robot being XAL02, the third robot being XAL03, etc. Considering server H, Table IV provides a directory with appropriate entries and the information and files thus contained.

TABLE IV

Server H

The directory	Contains
H:\Robot\Admin	Directories of customer families (1 directory per customer); Procpnr.SF (a list of all robots and their operational settings); Vcfile.SF (the version-controlled APL functions for the robots).
H:\Robot\Admin\XAL	Directories for the XAL robots, and an XAL customer directory.
H:\Robot\Admin\XAL\XAL01	The three files for robot XAL01: • XAL01.INI • Flag.HLD • Robosta2.SF
H:\Robot\Admin\XAL\XAL02	The three files for robot XAL02: • XAL02.INI • Flag.HLD • Robosta2.SF
H:\Robot\Admin\XAL\XAL03	The three files for robot XAL03: • XAL03.INI • Flag.HLD • Robosta2.SF
H:\Robot\Admin\XAL\...	Files for additional robot(s), if any...
H:\Robot\Admin\XAL\Cust	The customer lists for the XAL family: • Citycode.LST • Holiday.LST • Etc.

Reference is now made to Table V for similar information relative to Server I:

TABLE V

Server I

The directory	Contains
I:\Robot\Reports	Directories for the deliverables for each robot (ftp, email), and repositories.
I:\Robot\Reports\XAL	*.TXT files for the XAL family.
I:\Robot\Logs	Directories for records of results of processing for each robot.
I:\Robot\Logs\XAL	*.LOG files for the XAL family. See Naming Convention below.
I:\Robot\Daily	*.TXT, *.XLS, *.LOG files of statistics, counts, etc. for all robots. Each file name identifies its associated robot.

It is convenient to utilize a naming convention for log-file purposes, log-file names using the following convention:

(1) the first character in a log-file name is alphabetic, such as A, B, C., etc., thereby identifying log type;

(2) three characters can be used to represent the month in which the log-file was created;

(3) two characters can be used employed to represent the day in which the log-file was created; and,

(4) the next two characters represent the year in which the log file was created.

As an example, Table VI represents creation of a log-file name for an example given as Amar1500.log.

TABLE VI

Log File Name Creation for Amar1500.log

Filename:	Character	Month	Day	Year	Ext
Example:	A	mar	15	00	.log

Again referencing Figures 4 through 6 relative to startup procedures, a robot is started by clicking an icon for a given robot on a personal computer PC on which the robot runs. The icon contains:

C:\APLWIN30\aplw.exe h:\robot\admin\family\robot\robot.ini

where C:\APLWIN30\aplw.exe is the local copy of the APL application, and h:\robot\admin\family\robot\robot.ini is a run-time parameter pointing to the robot's .INI file on the H: server.

Example: C:\APLWIN30\aplw.exe h:\robot\admin\xal\xal01\xal01.ini

The .INI file contains:

[Config]
Wssize=40M
Initial workspace=24 ROBOT
Responsiveness=200

so APL (aplw.exe) will load '24 robot' as the initial workspace, whose size is 40 Mbytes.

When the robot is loaded, {quad}LX (a system variable) is also loaded in the workspace. {quad}LX contains <MAIN>, which therefore runs.

Once a robot has been started, it continues to operate 24 hours a day unless stopped by an error or by user request.

<MAIN> does the following:

1. Brings in remaining functions from the Version Control file (H:\.Robot\Admin\Vcfile.SF).
2. Calls <INIT>.
3. Attempts to perform an exclusive tie on Flag.HLD for the robot. (If the tie fails, the robot won't continue—this prevents another instance of the robot from starting up when one is already running.)
4. Creates a timer, which calls <MAIN_SR> once per minute.

<INIT> does the following:

1. Initializes customer variables as per .INI file entries; sets the robot's time zone.
2. Calls <INIT2>.
3. Calls <SET_KAFON>.
4. Calls <LOAD*DAILY>
5. Calls <SET*STUFF>

<INIT2> does the following:

1. Initializes more variables.
2. Calls <INIT3>.

<INIT3> does the following:

1. Sets up reservation-agent terminal-address codes and passwords.
2. Calls <SIGNIN*TAS>.

<SIGNIN*TAS> does the following:

1. Signs in to the CRS to establish communications (just as reservation agents would).

<SET_KAFON> does the following:

1. Gets the markets to be worked from the robot family's Citycode.LST file.
2. Gets the flight numbers for the markets from the CRS.

<LOAD*DAILY> does the following:

1. Gets the counters (statistics from previous runs) from the robot's Robosta2.SF file.

<SET*STUFF> does the following:

1. Calls <LOAD_SCHED>.

< LOAD_SCHED> does the following:

1. Gets the robot's processes and their daily start times from the .INI file.
2. Gets status information from the Robosta2.SF file.
3. Creates a variable Sched, containing a list of the robot's Tprocesses and their daily start times, Cprocesses, flags, and associated parameters.

<MAIN_SR> does the following:

1. Checks for a user-requested stop (user has clicked the STOP button in the robot's display window). If so, the robot halts.
2. Checks to see if the date has changed since the last time it was called.
   - If so, the robot restarts.
   - If not, calls <RUN_SCHED>.

With continued reference to Figures 4 through 6, running of the robots can further be described wherein it becomes necessary to understand that a Tprocess is any process which starts on a daily time schedule and then stops when completed. The schedule for a Tprocess is specified on a daily basis form information contained in the .INI file of the particular robot. A Cprocess is any process not scheduled by time but which is available to be run at any time during which a given robot is "up". A Cprocess should be run for only a small unit of work in order to give other T and C processes adequate time to be run. Cprocesses can be considered to be "cooperative" processes rather than "continuous" processes. According to the invention as now practiced, a maximum of seven Tprocesses and six Cprocesses are available for a robot to use when it is created by a programmer.

<RUN_SCHED> is the main routine for running processes. It steps in order through each Tprocess and Cprocess, based on the times or flags in Sched, as follows:

1. Gets the information on the processes to be run from Sched.
2. Calls **<RUN_TP_SCHED>** for the first Tprocess.
3. Increments the T-process counter (unless it equals 7, in which case it resets the counter to 1).
4. Calls **<RUN_CONT_SCHED>** for the first Cprocess.
5. Increments the C-process counter (unless it equals 6, in which case it resets the counter to 1).
6. Returns to its calling function (**<MAIN_SR>**).
7. The next time **<RUN_SCHED>** is called, it calls **<RUN_TP_SCHED>** for the next Tprocess, and **<RUN_CONT_SCHED>** for the next Cprocess, as per the counters for each process type.

<RUN_TP_SCHED> runs Tprocesses as per times in Sched.
The function has three arguments:

- Which Tprocess to call (as per the T-process counter).
- Which position (location) in Sched to get parameters for the process from ("position" was defined in **<LOAD_SCHED>**).
- Where to store status info in Robosta2.SF.

<RUN_CONT_SCHED> -- runs Cprocesses as per flags in Sched.
The function has two arguments:

- Which Cprocess to call (as per the C-process counter).
- Which position (location) in Sched to get parameters for the process from ("position" was defined in **<LOAD_SCHED>**).

When a process ends, it will set a flag signaling one of four events:

- Completely finished.
- Not finished—more to do.
- There was nothing to do.
- User requested a stop.

With continued reference to Figures 4 through 6 and further reference to Figures 2 and 3, an overview of batching and flight firming processes can be seen as follows:

<PROC_SCHED_LDS> runs as a Tprocess (currently once per day); uses information in INI file to tell other robots what flights (from Kafon and ignore list) and days to work.

<PROC_BUILD_LDS> builds LD commands to query CRS for who is flying on the day being worked.

<PROC_RUN_LDS> takes output of <PROC_BUILD_LDS> and issues commands to CRS to retrieve lists of PNLs, which go to the traffic cop.

<PROC_TRAFFIC_COP> runs as a Cprocess; coordinates (manages) batch-access to queues for the other processes.

<PROC_FIRST_ROUND> calls 1^{st}-round Flight-Firming processes

<PROC_SECOND_ROUND> calls 2^{nd}-round Flight-Firming processes

"Queue" refers to a pair of files: *filename*_CTL.SF (the control file) and *filename*_QUE.SF (the storage file).

Batch sizes currently range from 60 to 120, and are specified in three .INI file entries for each robot: "RUN LD BATCH SIZE=*n*", "FIRST ROUND BATCH SIZE=*n*", and "SECOND ROUND BATCH SIZE=*n*".

The specifics of batching and flight firming processes are further to be seen as follows:

<PROC_SCHED_LDS> writes a list of flights and a date to LDP queue. LDP queue contains flight lists and dates to be examined by other robots. This essentially starts the process and determines the workload for the day.

<PROC_BUILD_LDS> reads the LDP queue, writes to LDO queue.
LDO contains matrices of LD commands.

<PROC_TRAFFIC_COP> moves data from LDO to LDI queue.

<PROC_RUN_LDS> reads LD commands from LDI, issues the commands to the CRS, receives PNLs from the CRS, and puts PNLs on the CP queue.

<PROC_TRAFFIC_COP> reads the CP queue, compares each PNL against the entries in the 'VALIDPNR' file to check for new PNRs, and puts batches of all new PNRs on the FRI queue.

<PROC_FIRST_ROUND> reads the FRI queue, calls <PROC_PNR> for 1^{st}-round Flight-Firming processes to be performed on the new PNRs, and puts the results on the FRO queue.

<PROC_TRAFFIC_COP> reads the FRO queue, and updates or appends PNR information to the 'VALIDPNR' file.

<PROC_TRAFFIC_COP> continually checks the 'VALIDPNR' file for expired TTLs. If any are found, a list of their PNLs is created and put on the SRI queue.

<PROC_SECOND_ROUND> reads the SRI queue, gets a list of PNLs, calls <KILL*PNR> for 2^{nd}-round Flight-Firming processes to be performed on the corresponding PNRs, and puts the results on the SRO queue.

<PROC_TRAFFIC_COP> reads the SRO queue, and updates or appends PNR information to the 'VALIDPNR' file.

With reference to Table VII provided below, terms used herein are defined for ease of comprehension.

TABLE VII

Tprocess	A timed process
Cprocess	A continuous process
LDP Queue	List-Display Parameters queue
LDO Queue	LD Commands Out queue
LDI Queue	LD Commands In queue
CP Queue	Candidate PNRs queue
FRI Queue	First-Round Input queue
FRO Queue	First-Round Output queue
SRI Queue	Second-Round Input queue
SRO Queue	Second-Round Output queue
CRS	Central Reservation System (for airlines)
LD	List Display
PNL	PNR Record Locator (6 characters)
PNR	Passenger Name Record
TTL	Ticket Time Limit

With further reference to Figures 4 through 6, as well as to Figures 2 and 3 and also Figure 20, the processes of obtaining PNRs and identifying new PNRs is provided. Tables VIII and IX referable to Robot01 and Robot02 are now provided to further elucidate robot scheduling as is particularly to be found in Figure 5. System preparation necessary to obtain PNRs is particularly provided in Figure 7 while PNRs are obtained with reference to Figures 8 and 20. New PNRs are identified with reference to Figures 8 and 9.

Figures 10, 11 and 12 are provided for illustration of the function of the Sweeper robot as referred to hereinabove in performing first round flight firming functionality. Figures 10 through 12 are parts of a whole and are further linked directly to Figure 9 as well as being linked out to each other and also to Figures 13, 15, 26, 18 and 19.

TABLE VIII

Robot01

[Robot Settings]

RUN LD BATCH SIZE=300
FIRST ROUND BATCH SIZE=100
SECOND ROUND BATCH SIZE=100
CPROCESS1=PROC_TRAFFIC_COP
CPROCESS2=PROC_RUN_LDS
CPROCESS3=PROC_FIRST_ROUND
CPROCESS4=PROC_SECOND_ROUND
CPROCESS5=PROC_BUILD_LDS

TPROCESS2=PROC_SCHED_LDS 'DAILY FULL SCAN'
TPROCESS2-MON TIME=08:00 TPROCESS2-TUE TIME=08:00 TPROCESS2-WED TIME=08:00 TPROCESS2-THU TIME=08:00 TPROCESS2-FRI TIME=08:00 TPROCESS2-SAT TIME=11:00 TPROCESS2-SUN TIME=11:00
DAILY FULL SCAN-MON=0 60 DAILY FULL SCAN-TUE=0 60 DAILY FULL SCAN-WED=0 60 DAILY FULL SCAN-THU=0 60 DAILY FULL SCAN-FRI=0 60 DAILY FULL SCAN-SAT=0 60 DAILY FULL SCAN-SUN=0 60

TPROCESS1=Top_Of_Day
TPROCESS1-MON TIME=00:01 TPROCESS1-TUE TIME=00:01 TPROCESS1-WED TIME=00:01 TPROCESS1-THU TIME=00:01 TPROCESS1-FRI TIME=00:01 TPROCESS1-SAT TIME=00:01 TPROCESS1-SUN TIME=00:01

TABLE IX

Robot02

[Robot Settings]

FIRST ROUND BATCH SIZE=100
SECOND ROUND BATCH SIZE=100
CPROCESS1=PROC_BUILD_LDS
CPROCESS2=PROC_RUN_LDS
CPROCESS3=PROC_FIRST_ROUND
CPROCESS4=PROC_SECOND_ROUND

TPROCESS1= EMAIL_SUSPICIOUS_NAMES
TPROCESS1-MON TIME=00:01 TPROCESS1-TUE TIME=00:01 TPROCESS1-WED TIME=00:01 TPROCESS1-THU TIME=00:01 TPROCESS1-FRI TIME=00:01 TPROCESS1-SAT TIME=00:01 TPROCESS1-SUN TIME=00:01

TPROCESS2= ADD_CANCELS_TO_DB ''
TPROCESS2-MON TIME=00:02 TPROCESS2-TUE TIME=00:02 TPROCESS2-WED TIME=00:02 TPROCESS2-THU TIME=00:02 TPROCESS2-FRI TIME=00:02 TPROCESS2-SAT TIME=00:02 TPROCESS2-SUN TIME=00:02

In flight firming processing as occurs in the first iteration thereof, <PROC_PNR> does the following:

1. Applies rules to each new PNR:
   - Ignores PNR if no itinerary.
   - Calls **<CHECK_SUSPICIOUS_NAMES>** to compare names on PNR with known fictitious names.
   - Calls **<KILL_DUP_SEGMENTS>** as per INI file entry, to check for duplicate segments
     - Various .INI file entries determine the processing of duplicate segments, starting with whether or not duplicate segments will be killed
   - Calls **<FLOWN_DATA>** to scrape PNR if required by customer.
   - Calls **<IS_IT_TICKETED>** to look for any ticket numbers
   - If no ticket number was found, calls **<GET_OSITKT>** to see if a ticket number is in the OSI section of the PNR
   - If the PNR has a ticket number, processes as per customer rules, and checks for duplicate ticket number
   - If the PNR does not have a ticket number, checks for an existing TTL on the PNR
   - If the PNR has a TTL, either uses it or one 48 hours from today, whichever is later; includes message "TTL already found";
   - If the PNR does not have a TTL, calls **<PROC*PNR*STUB>** to do the following:
     - call **<FIRM_RULES1>** to determine if the PNR should be worked or ignored; if worked,
       - set TTL as per customer rules;
       - send "warn" or "kill" message to TA as per info in .INI file.
   - assigns TTL to PNR and save TTL with record locator; if required, calls **<DO*QEP>** and **<DO*ET*ER>** to queue the PNR as appropriate to the CRS.
   - Checks for TTL; if there is one, log in 'VALIDPNR' file
     - Calls
2. Updates internal counters.
3. Logs activities of 1st-round Flight Firming, and log images of PNRs ('F' log).

In flight firming processes having a second round such as would be accomplished by the Enforcer robot, reference is made to Figures 21, 22 and 23, which Figures are parts of the whole and which further are linked to Figures 18 and 19. The robot enforcer proceeds as follows:

<PROC_TRAFFIC_COP> reads the SRI queue, and calls **<KILL*PNR>**

<KILL*PNR> does the following:

1. Calls **<KILL_PNR_SUB2>** which reads the TTL on the PNR, sets appropriate variables.
2. Calls **<FIRM_RULES1>** which decides if PNR is to be ignored as per customer rules.
3. Calls **<KILL_PNR_SUB3>** to do the following, as per customer rules:
   - ignore the PNR if already ticketed;
   - if ticket number is a duplicate, ignore or queue PNR,
   - if queued, may put message on PNR re: "duplicate ticket number…"
   - decide if going to send 2nd message or cancel
4. Calls **<KILL_PNR_SUB1>** which works remaining saved PNRs:
   - queue or cancel PNR and send confirmation/action
   - send message on PNR to TA as per info in .INI file
   - save the record to the CRS

The functions thus provided are itemized in Table X as follows:

TABLE X

Custom-Coded Functions

Function	Description
<PROC*PNR*STUB>	Custom rules for 1st-round Flight Firming.
<KILL*PNR>	Custom rules for 2nd-round Flight Firming.
<TOP_OF_DAY>	Custom reports and reality checks to run once per day.
<FIRM_RULES1>	Custom rules for both 1st-round and 2nd-round Flight Firming.
<TOP_OF_DAY>	Custom code for each customer; runs just after midnight. Calls appropriate routines listed below for various activities.

Considering now the functionality for duplicate segment processing relative to typical .INI file entries, Table XI is provided and is referenced to Figures 15, 16 and 17 which are parts of a whole and which are linked to each other to provide duplicate segment processing.

TABLE XI

Typical .INI file Entries for Duplicate Segment Processing (DUPE SNOOPER)

Entry	Description
CHECK DUPE FOR CLASS = YES	When working Duplicate Segments, YES means there are class considerations.
CHECK DUPE FOR EXCLUSION CITIES-1 = YES	If entry = YES, then if duplicate segment has any city found in **CITY-1 DUPE LIST**, then queue PNR to **CITY-1 DUPE QUEUE** and don't do any more dupe checking.
CHECK DUPE FOR EXCLUSION CITIES-2 = YES	If entry = YES, then if duplicate segment has any city found in **CITY-2 DUPE LIST**, then queue PNR to **CITY-2 DUPE QUEUE** and don't do any more dupe checking.
CHECK DUPE FOR EXCLUSION CITIES-3 = YES	If entry = YES, then if duplicate segment has any city found in **CITY-3 DUPE LIST**, then queue PNR to **CITY-3 DUPE QUEUE** and don't do any more dupe checking.
CHECK TO KILL DUPE SEGMENTS = YES	YES means look for duplicate segments.
CITY-1 DUPE LIST = ARN BRU FRA MAD MXP CDG ZRH	See **CHECK DUPE FOR EXCLUSION CITIES-1**
CITY-1 DUPE QUEUE = QIY1/189	See **CHECK DUPE FOR EXCLUSION CITIES-1**
CITY-2 DUPE LIST = LHR LGW BHX MAN GLA	See **CHECK DUPE FOR EXCLUSION CITIES-2**
CITY-2 DUPE QUEUE = QIY2/189	See **CHECK DUPE FOR EXCLUSION CITIES-2**
CITY-3 DUPE LIST = JFK	See **CHECK DUPE FOR EXCLUSION CITIES-3**
CITY-3 DUPE QUEUE = CRC38/189	See **CHECK DUPE FOR EXCLUSION CITIES-3**
DUPE CLASS IGNORE = PFAZXJDIURC	If **CHECK DUPE FOR CLASS** = YES, these are the Classes that cannot be removed, even if they are duped.
Q IF JUST DUPE CLASS IGNORE CLASSES = YES	If **CHECK TO KILL DUPE SEGMENTS** = YES, and if **CHECK DUPE FOR CLASS** = YES, and all classes are in **DUPE CLASS IGNORE**, and this entry = YES, then queue the PNR.
Q TO USE IF ALL CLASSES UNTOUCHABLE = CRC110/189	If **CHECK TO KILL DUPE SEGMENTS** = YES, and if **CHECK DUPE FOR CLASS** = YES, and all classes are in **DUPE CLASS IGNORE**, and if **Q IF JUST DUPE CLASS IGNORE CLASSES** = YES, and there are not any classes in **EXCEPT DONT QUEUE CLASS** list, then this is queue to put the PNR in.

Duplicate ticket processing functionality can best be appreciated by reference to Table XII as follows:

TABLE XII

INI File Entry Variables for Duplicate-Ticket Checking, by Robot

Robot	RECORD TICKET NUMBERS	DUPLICATE TICKET QUEUE	QUEUE DUPLICATE TICKETED PNR	REPORT DUPLICATE TICKET NUMBERS
Ar01	YES	CRC465/11	YES	YES
Bwia01	YES	244/189	no	no
Bwia02	YES	244/189	no	no
Bwia03	YES	244/189	no	no
Copa01	YES		NO	NO
Ff01	YES	JFK/72	YES	YES
Ff02	YES	JFK/72	YES	YES
Ff03	YES	JFK/72	YES	YES
Ff04	YES	JFK/72	YES	YES
Gu01	YES		NO	NO
Ha01	YES	FIR100/11	YES	YES
Lr01	YES		NO	NO
Mx01	YES	JFK/72	YES	YES
N701	NO		NO	NO
N708	NO		NO	NO
Ta01	YES		NO	NO

Duplicate ticket processing is particularly checked according to the functionality disclosed in Figure 19 as can be appreciated relative to variables provided in Table XII. Figure 19 is linked to Figures 10, 18 and 22.

In first round flight firming processing, the following steps occur as relates to Figures 10 through 12 inter alia:

- <GET_ticket> processes lines in the PNR from <PULL_TICKETS> or <GET_OSITKT> to pull out any ticket numbers. If a ticket number is found, <GET_ticket> calls <RECORD_TKTS>.
    - If **RECORD TICKET NUMBERS** = YES, then <RECORD_TKTS> calls <LOG_VALTKT> to record ticket number, date of logging, and PNL in VALIDTKT file, and checks ticket number against the entries in VALIDTKT for a duplicate (other than itself).
    - If a duplicate ticket number is found, and **REPORT DUPE TICKET NUMBER** = YES, then <LOG_VALTKT> creates a variable duplog, containing the duplicate ticket numbers, markets, and dates, with an error flag "*DUP*"; duplog is then placed in the 'P' Log. (*Example*: *DUP* 1734180867713 WJJASE 28APR00 VS 1734180867713 SRMIHF 27APR00)
- If **QUEUE DUPLICATE TICKETED PNR** = YES, then <PROC_PNR> calls <HANDLE_DUP_TKT>, which sends the message "TKT ALREADY USED- PLEASE SUPPLY VALID TKT" to the travel agent and queues the PNR to the DUPLICATE TICKET QUEUE
- If **QUEUE DUPLICATE TICKETED PNR** = NO, then <PROC_PNR> sends the message "TKT ALREADY USED" and ignores the PNR

Relating to second round flight firming as particularly seen in Figures 21 through 23 as aforesaid, the following steps occur:

- <KILL_PNR_SUB3> calls <GET_OSITKT> to see if a ticket number is in the OSI section of the PNR.
  - <GET_OSITKT> calls <GET_ticket>, which processes lines in the PNR from <GET_OSITKT> to pull out any ticket numbers. If a ticket number is found, <GET_ticket> calls <RECORD_TKTS>.
    - If **RECORD TICKET NUMBERS** = YES, then <RECORD_TKTS> calls <LOG_VALTKT> to record ticket number, date of logging, and PNL in VALIDTKT file, and checks ticket number against the entries in VALIDTKT for a duplicate (other than itself).
    - If a duplicate ticket number is found, and **REPORT DUPE TICKET NUMBER** = YES, then <LOG_VALTKT> creates a variable duplog, containing the duplicate ticket numbers, markets, and dates, with an error flag "*DUP*"; duplog is then placed in the 'P' Log. (*Example*: *DUP* 1734180867713 WJJASE 28APR00 VS 1734180867713 SRMIHF 27APR00)
- If the ticket number was a duplicate, <KILL_PNR_SUB3> calls <HANDLE_DUP_TKT>, which sends the message "TKT ALREADY USED – PLEASE SUPPLY VALID TKT" to the travel agent and queues the PNR to the DUPLICATE TICKET QUEUE
- <KILL_PNR> calls <KILL_PNR_SUB1> to process the PNR according to whether it is to be ignored, removed from 'VALIDPNR' file, queued on the CRS, or have its TTL updated; PNR is then placed in the 'L' log.

Relative to Q-files and functions, descriptions and design considerations can be taken from comments to be found relative to definitions provided in <Q_QUEUE>. Essentially,

A **queue** is a pair of files. For each pair, one file is named *qqqqqq*_QUE, and the other is *qqqqqq*_CTL.

This is a dual-file mechanism for inter-robot communication.

- Blocks of "work" are appended to the _QUE file.
- A companion file—the _CTL file—is used as a "control" file to keep track of which block of work is to be de-queued next.

The format of each component in the _QUE file is:

1 The robot that queued the data.

2 The robot that de-queued the data. Empty indicates waiting to be de-queued.

3 The time the data was queued.

4 The time the data was de-queued.

5 The time the robot finished working on the data.

6 The data being queued to the robot (completely arbitrary).

This file is never held by anybody.

The "handle" returned as a result is the component number in the _QUE file. (Calling functions should pretend not to know that. In other words, no direct references to these files should be made by calling functions.)

There is one component in the _CTL file. It contains a short vector:

[1] Integer identifying the next component available to be worked. If this equals the second element of {quad}FSIZE on the _QUE file then there is no data to be worked in the queue.

[2] Highest component number in the range of contiguous worked items.

[3...] Subsequent positions represent components that are currently being worked or recently worked. Positive numbers are components being worked; negative numbers represent components that have been worked. (Negative numbers are eventually removed and reflected in position 2.)

The component in the control file must be small, because this file will be held and things must happen fast or there will be contention for the file. Also, a "critical write" strategy must be used so that the file is not left in some intermediate state when/if an error occurs.

Globals used:

TNC_*qqqqqq*	Tie number of control file.
TNQ_*qqqqqq*	Tie number of queue file.

All manipulations of the queue files should be through the Q_ functions, which are:

<Q_CREATE>	Creates a queue by creating the required pair of files and initializing them. R - The queue name.
<Q_CLEAR>	Empties a queue. (Logical empty, not physical erase. Works with share tie. Does not recover lost space.) L - Must be the scalar character 'S' to indicate you are sure. R - The queue name.
<Q_ERASE>	Physically erases the queue files. L - Must be the scalar character 'S' to indicate you are sure. R - The queue name.
<Q_OPEN>	Ties the files associated with the queue. A separate open function is implemented because tying the files seems to be when most of the overhead and complications occur. Could be called from <INIT>. R - The queue name.
<Q_CLOSE>	Unties the two queue files. R - The queue name.
<Q_QUEUE>	Queues some data to be worked by some process. L - The data to be queued. R - The queue name. Z - The handle to identify the queue element. Zero indicates failure.
<Q_DEQUEUE>	Retrieves a block of data to be worked. R - The queue name. Z - 1 *data* if successful; 0 ' ' if no data is on the queue.

<Q_WORKED> Marks a queue element as being worked.
L - The handle of the item to be marked.
R - The queue name.
Z - 0 ' ' indicates no items on queue.

<Q_ITEMS> Returns a count of how many un-worked, worked and "in progress" items are on the queue. (If "in progress" gets larger than the number of processors servicing the queue, then item(s) have probably been lost.)
R - The queue name.
Z – Number of items un-worked, worked, in progress.

<Q_READ> Re-reads a queue item. (Note that <Q_DEQUEUE> reads the item.) This function is called if a queue item needs to re-read for some reason. Presumably re-reads from the _QUE file should be kept to a minimum to reduce contention on this shared file.
L - the handle to be read.
R - the queue name.
Z - 1 *item retrieved* if successful; 0 ' ' if no data is on the queue.

<Q_MINE> Returns a list of handles that are currently shown as being worked by the robot calling this function. Useful for restart situations, maybe.
R - the queue name.
Z - Handles to identify the queue element. Empty indicates none.

<Q_CLEAN> Removes worked components from the queue files. (Don't use this frequently. It can cause contention.)
L - number of worked items to retain. If 0, or not supplied, remove all possible contiguous worked items.
R - the queue name.
Z - 0 ' ' indicates no items on queue.

<Q_REPORT> Reports on items being worked. Used to track down lost items (if that ever happens). This does not modify the queue in any way.
R - The queue name—essentially a file-name prefix (*qqqqqq*).
Z - Summary data pulled from the in-progress items: 'QUEUER', 'DEQUEUER', 'QUEUED AT', 'DEQUEUED AT', 'WORKED AT', 'DATA SHAPE'

To make sure <Q_REPORT> doesn't impact performance of other functions, this function is left unprotected against other processes manipulating the data while it is looking. So use this as a manual diagnostic and don't embed it into code that requires 100% accurate results. (Technically there should be a hold on the _CTL file throughout the time of reading the _QUE file. But that could be a lot of overhead if reading a lot of big components out of the _QUE file.)

Referencing the traffic copy functionality of the Sweeper robot, that is, <PROC_TRAFFIC_COP>, the following can be appreciated.

The Traffic Cop runs as a continuous function on one robot of the family.

It's the only process that ties/updates the VALIDPNR File and it determines the workload of other processes.

Result: Z -1=nothing done; 0=something done

Z will be set to zero many places below (anywhere we do any sort of work).

The traffic copy spools off stuff for these other processes to do:

* PROC_BUILD_LDS (Formerly part of PROC_PNRS) A process to identify the flights to be firmed and construct the LD commands to be done. This process builds a matrix of LD commands for some other process to actually run.
* PROC_RUN_LDS (Formerly part of PROC_PNRS). A process that runs the LD commands and returns a list of record locators. The only processing it does on the record locators is simple de-duping. The traffic cop will then do further de-duping against the master list and determine which record locators are new.
* PROC_FIRST_ROUND (Formerly part of PROC_PNRS) First round flight firming.
* PROC_SECOND_ROUND (Formerly PROC_TTL_QUEUE) Second round flight firming.

Every section must be tolerant of restarting. Some guidelines:

* Obviously nothing must be marked as "worked" until it has been definitely passed on to the next stop along the way. This usually means that the call to Q_WORKED follows the call to Q_QUEUE.
* Be careful where you call POST*MSG. Remember that it can QLOAD. It shouldn't be called at points where we don't want a restart.
* Be careful about calling functions that might provoke QLOADS. Since we don't talk to a CRS in this function, we should be able to avoid most QLOADS (the file covers can also QLOAD though, due to file/network problems).
* Keep this function isolated from the CRS. Don't talk to the CRS here.

The QN_ variables are the names of the various queues.

THR_ variables are the "threshold" for queues we are feeding. When the number of un-worked items on the queue falls below this threshold it means we want to supply more work. We try to put off building new work until the last minute because that usually helps us achieve efficiency by batching.

OPEN_FF_QUEUES

'TRAFFIC COP STARTING'

BUILD_LDS to US.

US to RUN_LDS.

RUN_LDS to US.

US to FIRST_ROUND.

FIRST_ROUND to US.

US to SECOND_ROUND.

SECOND_ROUND to US.

GLBL 'RUN LD BATCH SIZE'

GLBL 'FIRST ROUND BATCH SIZE'

GLBL 'SECOND ROUND BATCH SIZE'

FTIE '35 TRAFFIC'

Component 1 - PNRs that are in progress in first round

Component 2 - PNRs that are in progress in second round

Component 3 - PNRs that need to be retried in first round

Component 4 - PNRs that need to be retried in second round

Tell PROC_BUILD_LDS what to do. In this implementation PROC_BUILD_LDS decides what to do based on his old parameters. In the future we could have multiple instances of PROC_BUILD_LDS each building LDS for the days (ranges) we tell them to.

Pass the results of PROC_BUILD_LDS on to instances of PROC_RUN_LDS.

'BUILDING LDS QUEUE'

See if we have anything to work from a restart.

' - REWORKING INTERUPTED BATCHES ON LDO'

' - WORKING NEW QUEUE ITEMS ON LDO'

Process the results of PROC_FIRST_ROUND guys by updating the VALIDPNR file. We do this before sending new stuff to the first round guys so that the VALPNR will be as up to date as possible (that's probably not strictly necessary because we have the record locators in progress noted somewhere).

See if we have anything to work from a restart.

'PROCESSING FIRST ROUND OUTPUT QUEUE'

' - REWORKING INTERUPTED BATCHES ON FRO'

' - WORKING NEW QUEUE ITEMS ON FRO'

Action=0 means we didn't work PNR

' - UPDATING VALID PNR FILE'

Merge new VPNR entries into VALIDPNR file.

' - MARKING ITEMS AS WORKED ON FRO'

Note: We record the in-progress record locators below in 35 TRAFFIC. We're going to keep getting stuff from the RUN_LDS guy while these PNRs are being processed and they won't go into the VALPNR file until they are processed. And we will need to "un-note" them in the code above. Eventually we are going to record this information in the VALIDPNR file.

Pass new record locators to PROC_FIRST_ROUND. When the first round guys get short on work take the results of PROC_RUN_LDS and send them to the first round guys. We build the batches such that record locators in the same "bucket" are grouped together. So that the batches can be most effectively organized, we don't do this until the queue of unprocessed work is running low. We build the batches such that record locators in the same "bucket" are grouped together.

'BUILDING FIRST ROUND INPUT QUEUE'

Number of new PNRs to pull off queue at a time.

We can cache this until we start adding to it below.

See if we have anything to work from a restart.

' - REWORKING INTERUPTED BATCHES ON CP'

' - WORKING NEW QUEUE ITEMS ON CP'

Guessing that 1 in 5 PNRS will be new.

C Flags new PNRs.

Note that we've checked for "in-progress" PNRs above.

C Flags new PNRs.

'P' LOG_DATA 'TRAFFIC COP NEW PNRS:'

'P' LOG_DATA PNRS,'*'

Group by buckets.

We now have all new candidate PNRs in PNRS and a bunch of queue elements in progress.

FOR THE MOMENT WE ARE JUST THROWING THE RETRIES AWAY

' - QUEUING TO FRI'

' - MARKING ITEMS WORKED ON CP'

Process the results of PROC_SECOND_ROUND guys by updating the VALIDPNR file.

Process the results of PROC_FIRST_ROUND guys by updating the VALIDPNR file.

We do this before sending new stuff to the first round guys so that the VALPNR will be as up to date as possible. (That's probably not strictly necessary because we have the record locators in progress noted somewhere.)

See if we have anything to work from a restart.

'PROCESSING SECOND ROUND OUTPUT QUEUE'

' - REWORKING INTERUPTED BATCHES ON SRO'

' - WORKING SRO'

Action=0 means we didn't work PNR

' - UPDATING VALIDPNR FILE'

Merge new VPNR entries into VALIDPNR file.

' - MARKING ITEMS WORKED ON SRO'

Pass record locators with expiring time limits to PROC_SECOND_ROUND. So that the batches can be most effectively organized, we don't do this until the queue of unprocessed work is running low. We build the batches such that record locators in the same "bucket" are grouped together.

'BUILDING SECOND ROUND INPUT QUEUE'

GET_EXPIRING_TTLS BASE_TIME

PNRs in progress and therefore blocked from being worked

PNRs in need of retrying

FOR NOW WE ARE JUST THROWING RETRIES AWAY (THEY WILL HAPPEN QUITE OFTEN IN SECOND ROUND ANYWAY)

'R' LOG_DATA 'RETRIES OF SECOND ROUND PNRS:'

'R' LOG_DATA C

Comments provided relative to the several processes of the present methodology are to be found in Table XIII as follows:

TABLE XIII

Comment Lines from Processes

Process	Comment Lines
ADD_CANCELS_TO_DB (Tprocess)	Cover function for AddCancelsToDB (so it can be run as a TProcess) ARG: R[1] - BEGINNING DATE (IN JULIAN FORMAT) *NOTE: IF EMPTY, USE DEFAULT OF YESTERDAY R[2] - ENDING DATE (EMPTY IF ONLY FOR ONE DAY) RESULT: Z - ¯1 TO KEEP THE SCHEDULER RUNNING NORMALLY
ADD_ITIN_FROM_HIST	GET FLOWN LEGS OF ITINERARY AND ADD BACK INTO PNR ARG: R - [1] PNR [2] NUMBER OF LINES NAME TAKES UP L - HIST (IF GIVEN) RESULT: RECREATED PNR
ADD_TO_ITIN	ADD MORE FIELDS OF INFORMATION TO AN R (THAT CAN BE DEDUCED) ARG: R - R RESULT: (64↑R),LEG INDICATOR,LEG #,O+D
AddCancelsToDB	Insert cancel information for the date(s) given into the CANCEL.MDB database ARG: R[1] - BEGINNING DATE (IN JULIAN FORMAT) R[2] - ENDING DATE (EMPTY IF ONLY FOR ONE DAY) RESULT: ¯1 (TO KEEP SCHEDULER RUNNING NORMALLY)
BUILD_1D_FLIGHT_LST	RETURN A LIST OF FLIGHTS OPERATING ON 1 (OR MORE) DAYS.
BUILD_SCRAPE_REC	BUILD A RECORD CONTAINING TONS OF STUFF SCRAPED FROM A PNR ASSUMES A BAZILLION VARIABLES ARG: R - [1]-NameList [2]-TICKETS [3]-FFN RESULT: A LONG VECTOR IF ONLY 1 NAME; OR A WIDE MATRIX IF MULTIPLE NameList

CHASE_DIVIDED	GO THROUGH A PNR AND IF THERE IS A DIVIDED RECORD INDICATED, GO TO ITS PARTNER AND GET MORE INFORMATION, DEPENDING ON THE OPERATION ASKED FOR OP=1; Finds the original number in party for a PNR if it has been divided OP=2; Stop the first time you find a paid TK for A class OP=3; Stop the first time you find a Stored Fare (*WS) *** WARNING *** BECAUSE THIS FUNCTION SENDS DISPLAY COMMANDS TO THE CRS, IT MAY LEAVE YOU IN A DIFFERENT STATE THAN YOU EXPECT - I.E. YOU MAY NEED TO REDISPLAY THE PNR YOU STARTED WITH IF YOU PLAN ON RUNNING SUBSEQUENT COMMANDS ARG: R[1] - OP R[2] - PNR R[3] - OP=1;NUMBER IN PARTY FOR CURRENT PNR (USUALLY GLOBAL 'NP') OP=2;INDEX OF WHICH ITIN TO USE L - LIST OF RECORD LOCATORS TO SKIP RESULT: Z - DEPENDS ON OP OP=1; ORIGINAL NUMBER IN PARTY OP=2; 1= THERE WAS A PAID UPGRADE ELSE 0 OP=3; (*WS) IF ONE FOUND; ELSE EMPTY
CHECK_SUSPICIOUS_NAMES	Check for suspected ficticious names in the current PNR and log them if found. * NOTE: This function depends on globals 'BadNames' and 'NBadNames'.
CHECK_TICKETED	CHECK SOME ASPECT OF PNR EVEN THOUGH IT HAS BEEN TICKETED.
CHG*VALPNR	LOOKUP A PNL IN OUR LIST OF VALIDS AND CHANGE ITS TTL TIME ARG: R - PNL L[1] - LATEST KNOWN ITIN DATE (CAN BE PURGED AFTER THIS DATE) L[2] - TICKET TIME LIMIT L[3] - PASS L[4] - COUNTER RESULT: VECTOR OF 1=CHANGED OK, OR 0=NOT
DO*ET*ER	DO EITHER AN 'ET' OR 'ER' COMMAND TO SAVE A Pnr.
DO*QEP	DO A 'QEP' COMMAND TO SAVE A Pnr.
EMAIL_SUSPICIOUS_NAMES (Tprocess)	Compiles then emials suspicious name report to customers RESULT: Z - ¯1 TO INDICATE COMPLETION OF TPROCESS TO S CHEDULER

EXCEL_REPORT	Create statistics Excel report based on template for the dates given. ARG: R[1] - START DATE * IF R IS EMPTY THEN PROMPT R[2] - END DATE * IF 1=ρR THEN IT IS MONTH TO DATE RESULT: Z - FULL PATH TO XLS REPORT FILE CREATED
EXPAND_ITIN_N7	EXPAND (IF APPROPRIATE) A THRU FLIGHT INTO SMALLER LEGS ARG: L - BRD,OFF (THIS WILL GIVE YOU THE CLUE THAT THE ITINERARY NEEDS EXPANDING) R - ITIN RESULT: [1] NEW ITIN [2] NEW DAYS EX: LET'S SAY THE ITIN SHOWED LAX-MDW, BUT L SHOWS LAX-LAS (OR LAS-MDW) NEED TO ADD A LAX-LAS LEG AND CHANGE LAX-MDW TO LAS-MDW NOTE: THE ADDED LEG WILL INHERIT EVERYTHING, WHICH MAKES NO SENSE FOR TIMES MORE NOTE: THIS ASSUMES LAS IS THE ONLY HUB CITY
FIRM_RULES1 (custom coded for each customer)	DO SOME FIRMING RULES; CALLED BY PROCΔPNRΔSTUB AND KILLΔPNR. ARG: R - PROCESS NAME RESULT: 0=OK; 1=NEEDS TO BE SKIPPED
FLOWN_DATA	RIP A PNR APART THAT WAS IN THE VCR QUEUE ARG: R - PNR HIST L - RESULT: HUGE SCRAPED RECORDS OF ALL YOU WOULD EVER WANT TO KNOW ABOUT A PNR
FLOWN_FF_TABLE2	LOOK UP DEFAULT FREQUENT FLYER CREDIT WHEN OTHER PROCESSES WOULDN'T GET IT FOR US ARG: L - CLASS OF SERVICE R - ORIG,DEST RESULT: FREQUENT FLYER POINTS

FLOWN_FP_TABLE2	LOOK UP DEFAULT FARE WHEN OTHER PROCESSES WOULDN'T GET IT FOR US ARG: L - CLASS OF SERVICE R - ORIG,DEST RESULT: FARE AMOUNT
GATHER_PNRCTR	GATHER UP ALL THE OPERATIONAL COUNTERS. ARG: R - DATE TO DO IT FOR L = 1 - DO ALL ROBOTS WITHIN THIS CUSTOMER; ELSE JUST ONE THAT'S RUNNING RESULT: COUNTERS FOR ALL ROBOTS ADDED TOGETHER
GET_ATN_TKT	TRY TO FIND AN ATN TYPE TICKET NUMBER ARG: R - SECTION OF PNR TO LOOK IN L - HOW MANY DIGITS TO ACCEPT IF NOT A WELL FORMED ATN RESULT: TICKET NUMBER
GET_EXPIRING_TTLS	CHECK FOR EXPIRED TIME LIMITS ARG: R - TIME LIMIT TO CHECK AGAINST (PACKED DATE DDDDDHHHH) RESULT: LIST OF VALIDPNR FILE ENTRIES
GET_FIRST_PNR_DATE	GET FIRST TIME/DATE FROM PNR START FROM TOP AND STOP FIRST TIME GET A LEGIT TIME/DATE NOTE: THERE SHOULD BE A TIME ON THE 2ND LINE OF HISTORY ARG: R - TIME ZONE TO CHANGE IT TO L - [1] 1=USE AN ALTERNATE WAY TO GET DATE [2] 1=INCLUDE ALL CARRIERS SEGMENTS RESULT: Z[1]-DATE Z[2]-TIME

GET_NAMES3	Return party names as a matrix with one party (not individual) name per row. ARG: R - PNR L - 1 = ACCEPT CORPORATE NAMES RESULT: [1]-NAMES [2]-NUMBER OF PARTY [3]-LAST LINE OF NAME SECTION IN PNR NAME - A matrix of party names as found in the R (use COMBINE∆NAMES to get individual names rather than party names). We retain the title, if any was specified. Callers should note that it is common for the title to be missing the blank ahead of it. Example of PNR name section is: n. 2LAST/FIRST1/FIRST2* CO41/ 2.2CHR n+1.1LAST/NAME MR 1SMITH/POCAHANTAS n. 1PERKINS/MARLIN Name section ends when one of the following is encountered: A line with no "/". A line where the party member count doesn't equal the number of slashes. ASSUME DROP_MSG_PNR HAS BEEN RUN
GET_OSITKT	ARG: R - PNR. IF R IS NESTED; THEN IT'S SPECIAL CASE OF JUST OSI LINES. L[1] - HOW MANY TICKETS EXPECTED. L[2] - HOW MANY DIGITS TO LOOK FOR. L[3] - 1=SKIP KEYING OFF OF TOKEN ONLY IN A RANDOM SEARCH. L[4] - 0=LOOK FOR TKT AND 10 DIGIT IF ALL ELSE FAILS 1=DON'T RIP A PNR APART TO GET TICKET NUMBERS. RESULT: (RC)(TKT NOS OR ERROR MSG)(TKT NOS IF RC=1∧HAVE REAL TICKETS, BUT SOMETHING WRONG). RC=1; SUSPECT OR REAL TKT NO. IF 2ND ITEM IS MATRIX; THEN REAL TKT NOS; ELSE WHY IT'S A SUSPECT. RC=2; VIOLATED SOME RULE. RC=3; ERROR.

GET_SECTION	GET A SECTION OF A PNR BASED UPON A SECTION NAME ARG: R - PNR TO LOOK IN L - SECTION NAME RESULT: CHAR MATRIX OF SECTION OR EMPTY IF NOT FOUND
GET_ticket	LOOK FOR TICKET NUMBER IN ONE LINE OF TEXT ARG: R - LINE WITH TICKET NUMBER ON IT (WE HOPE) L[1] - HOW MANY TICKETS TO EXPECT; IF =0, TAKE WHATEVER WE FIND L[2] - NUMBER OF DIGITS THRESHOLD TO EVEN CONSIDER IT BEING A TKT NBR L[3] - 1=LOOK FOR WORDS 'TKT' OR LIKE AND 10 DIGIT NUMBER, IF ALL ELSE FAILS RESULT: [1] RETURN CODE 1=OK [2] TICKET NUMBER OR ERRMSG
GET_TICKETS	GET THE TICKET NUMBERS OUT OF A SABRE MULTI-HOST PNR (I.E. IT WILL ONLY WORK FOR HA) ARG: R - PNR TO STRIP RESULT: CHAR MATRIX OF TICKET NUMBERS
GET_TOURAMT	IS THERE A TOUR PACKAGE AMOUNT ARG: R - PNR TO CHECK OUT RESULT: [1] 1=YES [2]=AMOUNT

GLBL	Using modified code from INISection to not use nesting. -New GLBL using INIString and INISection. -Reads entries out of an ini file. -RESULT: ↑↑ -Default ini file name: subadminlib, robot, '.ini'. -Default section: [Robot Settings]. -Default not-found result: ''. This is returned if the file, section, or R are not found. -All results are UPPERCASE. -Syntax: L GLBL R ARG: R (char string) is the setting to read. If the R is '*', the entire section is read and all non-blank lines not beginning with ';' are returned with leading blanks removed. Optional left argument (L, char string): L has the form: 'file.ini[section]{not-found result}'. Any chars before the first '[' are read as the ini file name and path. If nothing appears before the first '[', the ini file defaults to: subadminlib,robot,'.ini' The section name is the chars between '[]'. If no '[' appears, the section defaults to [Robot Settings]. The not-found result is the chars between '{}'. If no '{' appears, the not-found result defaults to ''. Note: case does not matter in any of the arguments. -Example: 'c:\windows\aplw30.ini[config] GLBL 'wssize' returns the wssize=setting in the [config] sections of the c:\windows\aplw30.ini file.
HANDLE*MSG	WRITE OUT MESSAGE TO DIFFERENT PARTS OF SCREEN.
HANDLE_DUP_TKT	WHAT TO DO WHEN YOU HAVE DUPLICATE TICKET NUMBERS ARG: R - ROBOT NAME RESULT: 1=L16a (FINISH SENDING PNR) 2=L16ae (Q IT) 3=L16x (DON'T WANT TO SEE IT AGAIN)
INIT	CREATE/SETUP A WHOLE BUNCH OF STUFF.
INIT2	INITIALIZE GLOBAL VARIABLES.
INIT3	SIGNIN TO RESERVATION SYSTEM.
IS_IT_TICKETED	DOES A PNR HAVE THE TICKETING FIELD FILLED IN.

KILL*PNR	PROCESS A PNR BECAUSE OF TIME LIMIT EXCEEDED. SABRE - tower. ARG: R - IF SIMPLE; PNR TO PROCESS. IF COMPLEX (PNR Hist RecLoc Pnl). L[1] - TTL.
KILL_DUP_SEGMENTS	REMOVE DUPLICATE SEGMENTS. A DUPLICATE IS DEFINED AS: 1. SORT ITIN BY FLIGHT TIME. 2. THEN ANY IDENTICAL O/D THAT OVERLAP IN TIME.
KILL_PNR_SUB1	DO BOTTOM PORTION OF A KILL_PNR. ARG: R[1] - BRANCH POINT INDICATOR OF WHERE TO GO. R[2] - (IF PRESENT) TTL TO SET AFTER QING (IF APPLICABLE). L - WHERE TO QUEUE, IF GOING TO.
KILL_PNR_SUB2	COMMON SUBROUTINE TO KILL_PNR. ARG: R - ARG PASSED IN FROM KILL_PNR. RESULT: 0=CONTINUE; 1=DON'T LOOK AT AGAIN; 2=CHANGE TTL.
KILL_PNR_SUB3	DO COMMON LINES FOR KILL_PNR. ARG: R- LEFT ARG TO KILL_PNR (CURRENT TIME AT HDQ). RESULT: POINTER INDICATING WHERE TO GO AFTER EXECUTION (LABELS SHOULD MATCH).
LOAD*DAILY	LOAD DAILY DATA. RESULT: CONTENTS FROM COMPONENT (IN THE CASE THAT THE COMPONENT IS 9 (COUNTERS) THEN THE RESULTS FOR THE MIRROR COUNTERS WILL BE RETURNED AS WELL - ρZ WILL BE 2 INSTEAD OF 1. USE CURRENT ROBOTSTA2 IF NOT EXPLICITLY REQUESTED OTHERWISE.
LOAD_SCHED	SET UP SCHEDULING PARAMETERS.
LOG_DATA	PUT DATA INTO A LOG FILE. ARG: L - WHAT TYPE OF LOG FILE - SINGLE CHAR. R - CHAR MATRIX OF WHAT TO LOG.
LOG_VALTKT	RECORD A TICKET NUMBER IN OUR LIST OF VALID TICKETS ARG: R - TICKET L - 1=REPORT BACK THAT IT ALREADY HAS BEEN STORED RESULT: 1=A TICKET NUMBER HAS PREVIOUSLY BEEN STORED

MAIN	TRAPS ALLOWING INTERRUPTS TO BE CAPTURED, REQUEST CONTINUE OR RETURN TO PREVIOUS SAFE POINT, STOP AT THAT POINT, OR DISPLAY ANY OTHER ERROR THAT HAS OCCURRED.
MAIN_SR	TRAPS ALLOWING INTERRUPTS TO BE CAPTURED, REQUEST CONTINUE OR RETURN TO PREVIOUS SAFE POINT, STOP AT THAT POINT, OR DISPLAY ANY OTHER ERROR THAT HAS OCCURRED. MAIN ROUTINE FOR WHEN FORM TIMES OUT - WHERE THE WORK IS DONE.
MAKE_CITYCODE	MAKE UP A LIST OF VALID CITIES AND OTHER NICE STUFF. ARG: R[1]=1 LOOK FOR NEW CITIES THAT MIGHT NOT BE IN CITYCODE.LST IF R[1]=1 AND R[2]=1, THEN PUT NEW ENTITIES BACK IN CITYCODE.LST RESULT: [1] BRD(3) [2] OFF(3) [3] TIME ZONE (4) [4] DOM/INT (1) [5] FIRMING RULE (4+) [6] FLTS(4) OR EMPTY IF NO COLUMN [7] DEPARTURE DATE(5) OR EMPTY IF NO COLUMN CityCode NEEDS TO BE LOCAL AND UNDEFINED; USED IN BUILD_1D_FLIGHT_LST
PROC*PNR*STUB	DO FIRST ROUND FIRMING - SABRE. ARG: R - TIME OF BOOKING L - RESULT OF GET∆OSITKT RESULT: 1 - DO A SAVE AFTER RETURN 2 - JUST RECORD AND MOVE ON AFTER RETURN 3 - IS AN OSI TKT NUMBER 4 - SEND TO ERROR Q SINCE THERE IS NOT TTL, THEN WE HAVE TO PUT ONE ON. LOOK TO HANDLE SPECIAL RULES. MOST ARE INTERNATIONAL, BUT THERE IS AT LEAST 1 DOMESTIC. RULES SHOULD BE PRETTY WELL MUTUALLY EXCLUSIVE.
PROC_BUILD_LDS (Cprocess)	BUILD A COMPLETE SET OF LD COMMANDS FOR FLIGHTS WE WANT TO WORK. RESULT: Z=¯1 - NOTHING DONE Z=0 - SOMETHING DONE Z=1 - USER REQUESTED STOP Z=2 - COMPLETE SET HAS BEEN DONE, TIME TO START OVER

PROC_FIRST_ROUND (Cprocess)	DO FIRST ROUND FLIGHT FIRMING (SETTING TTLS, ETC.) THIS SHOULD BE A T PROCESS THAT DOES NOT RUN ACROSS MIDNIGHT. RESULT: Z=¯1 - NOTHING DONE Z=0 - SOMETHING DONE Z=1 - USER REQUESTED STOP
PROC_PNR	PROCESS A PNR; ULTIMATELY TRYING TO GET IT TICKETED ARGS: R - IF SIMPLE, PNR TO PROCESS; IF COMPLEX (PNR Hist RecLoc) L[1] 1=LOG SCRAPED DATA
PROC_RUN_LDS (Cprocess)	RUN A BATCH OF LD COMMANDS AND ISOLATE RECORD LOCATORS. RESULT: Z=¯1 - NOTHING DONE Z=0 - SOMETHING DONE Z=1 - USER REQUESTED STOP Z=2 - COMPLETE SET HAS BEEN DONE, TIME TO START OVER

PROC_SCHED_LDS	TELL THE BUILD LD ROBOTS WHAT TO DO. R is a character string that we use to construct the keyword for the INI file to retrieve our parameters. If R is "FULL SCAN" we would catenate on todays day of the week and look for the keyword FULL SCAN-MON for example to retrieve our parameters. Our parameters are as follows: * A list of dates means we work only those dates. Individual dates may be separated by spaces. Date ranges may be specified by separating two dates by a dash. If no year is specified in a date we work that date every year. Examples: 19MAY 21MAR2000 02JUL-07JUL * A vector of two or three numbers means we use the first as an offset from today, the second specifies how far out we go in days, the third (optional) specifies an interval (4 would mean work every 4th day). These parameters make the "shotgun" mechanism obsolete. It is no longer supported. Also PNR OFFSET and PASSES are now obsolete. Later we'll add a way to specify the flights/markets to be worked also. RESULT: THE USUAL RUN_SCHED STUFF, WE ALWAYS RETURN 0 AT THE MOMENT. Z=¯1 - NOTHING DONE Z=0 - SOMETHING DONE Z=1 - USER REQUESTED STOP
PROC_SECOND_ROUND (Cprocess)	DO SECOND ROUND FLIGHT FIRMING (CANCELING EXPIRED TTLS, ETC.) THIS SHOULD BE A T PROCESS THAT DOES NOT RUN ACROSS MIDNIGHT. RESULT: Z=¯1 - NOTHING DONE Z=0 - SOMETHING DONE Z=1 - USER REQUESTED STOP

PROC_TRAFFIC_COP (Cprocess)	The Traffic Cop runs as a continuous function on one robot of the family. It's the only process that ties/updates the ValidPnr File and it determines the workload of other processes. RESULT: Z=¯1 - NOTHING DONE; Z=0 - SOMETHING DONE The traffic cop spools off stuff for these other processes to do: * PROC_BUILD_LDS A process to identify the flights to be firmed and construct the LD commands to be done. This process builds a matrix of LD commands for some other process to actually run. * PROC_RUN_LDS A process that runs the LD commands and returns a list of record locators. The only processing it does on the record locators is simple de-duping. The traffic cop will then do further de-duping against the master list and determine which record locators are new. * PROC_FIRST_ROUND First round flight firming. * PROC_SECOND_ROUND Second round flight firming.
PULL_ITIN	USE THE STANDARD WAY TO GET ITINERARY FROM A PNR RESULT: 1=GOOD 2=NO ITINERARY 3=GROUP REMEMBER: ANY CALLING ROUTINE MUST HAVE ALREADY RUN THE FOLLOWING LINES (Cit Zones FLGTTL)←CityCode[1 3 4] DomCitTtl←(FLGTTL∧.=(¯1↑ρFLGTTL)↑'D')⌿Cit Zones←basetz,[1]Zones ADD ON DEFAULT TD←CURRENT_DATE
PULL_SABRE_WP	GET ALL OF THE PIECES NEEDED TO BUILD A WP ARG: R - PNR TO WORK ON L - 1=GO CHASE DIVIDED PNRS FOR THE *WS RESULT: Z[1] 1=OK 0=NOT Z[2] - AMOUNT OF TICKET Z[3] - WP TO PRICE Z[4] - BASE AMOUNT PER PERSON Z[5] - STORED FARE IMAGE Z[6] - ITIN Z[7] - TICKETED DATE Z[8] - DAYS

PULL_TICKETS	PULL THE TICKETS OUT OF A PNR ARG: R - CHAR MATRIX OF PNR TO CHECK RESULT: (RC;0=NO TKTS, 1=RELIABLE TKTS, 2=UNRELIABLE TKTS, 4=TKTS SEEN BEFORE)(TKTS) *** NOTE *** WE DON'T KNOW HOW TO REALLY PULL TICKET, SO FIGURE IT OUT IF YOU NEED TO
READ_PNR	READ IN A PNR AND DO NECESSARY TRANSLATION INTO A CONSISTENT FORM ARG: R - EITHER COMMAND TO EXECUTE OR A PNR L - IF EXIST; THEN TA TO ISSUE CMD - OTHERWISE IS A PNR RESULT: UNIFIED PNR THE GENERALIZED PNR HAS THESE IN THESE POSITIONS: CA - 4, 5 FLT # - 5 thru 9 CLASS - 10 DATE - 11 thru 16 RESERVED - 17 INDICATOR THAT DATE IS GUARANTEED TO BE IN PAST BRDOFF- 19 thru 25 STATUS- 27, 28 DEPT - 31 thru 36 ARR - 37 thru 41

READ_SABRE_LINEAR	READ THE LINEAR AND RETURN FARE, XF, FARE BASIS; SO FAR THIS WORKS ONLY FOR CASES THAT FOLLOW NOTE: IT NOW WORKS FOR NEARLY EVERYONE, WITH SPECIAL SECTIONS FOR APOLLO THERE ARE MORE COMPLICATED CASES OF CONNECTIONS THAT HAVEN'T BEEN SEEN/TRIED YET ((2 3ρ'MDWLAS') ca 2)READ_SABRE_LINEAR'MDW ca LAS133.34 ca MDW133.33KR14NR 266.67 END ZPMD W2LAS2 XFMDW3LAS3' ((2 3ρ'SEASJC') ca 2)READ_SABRE_LINEAR'SEA ca SJC100.93K ca SEA137.96YF 238.89 END ZPSEA2SJC2 XFSEA3SJC3' ((4 3ρ'SEASJCLASRNO') ca 4)READ_SABRE_LINEAR 'SEA ca SJC98.91K/MCS29 ca LAS98.00K/MCS29 ca X/RNO ca SEA130.64KO/MCS29 327.55 END ZPSEA2SJC2LAS2RNO2 XFSEA3SJC3LAS3RNO3' ((2 3ρ'LASMDW') ca 1) READ_SABRE_LINEAR'LAS ca MDW180.56Q14NR END ZPLAS2 XFLAS3' ((2 3ρ'LASMDW') ca 1) READ_SABRE_LINEAR'LAS ca MDW 452.78F7 END ZPLAS2 XFLAS3' ((2 3ρ'LASLAX') ca 2) READ_SABRE_LINEAR'LAS ca LAXATV0.00 N7 LASATV0.00 0.00END' ((2 3ρ'RDUTPA') ca 2) READ_SABRE_LINEAR'RDU ca TPA Q3.00 54.63LE7NR ca RDU Q3.00 148.61VE21NN 209.24 END ZPRDU2TPA2 XFTPA3 XFTPA3' ((3 3ρ'LGARDUORF') ca 3) READ_SABRE_LINEAR 'LGA ca X/RDU Q3.00 ca ORF164.36QE14NN/-RDU ca LGA Q3.0063.89WE21PN 234.25 END ZPLGA2RDU2RDU2 XFLGA3RDU3RDU3' ((3 3ρ'LAXNYCLAS') ca 3) READ_SABRE_LINEAR 'LAX ca NYC Q9.30 Q4.65 138.60K23NR ca LAS236.28HA3 ca LAX Q9.30 52.09QOW 450.22 END ZPLAXMDWJFKLAS XFLAX3JFK3LAS3' FOLLOWING ARE APOLLO EXAMPLES ((2 3ρ'LAXLAS') ca 2) READ_SABRE_LINEAR'LAX ca LAS R32.50KR7NR/CD ca LAX R32.50KR7NR/CD END FARE USD 65.00 TAX 6.00XF 5.20US 4.00ZP TOT USD 80.20' ((2 3ρ'DFWLAS') ca 2) READ_SABRE_LINEAR'DFW ca LAS R236.28HA3 ca DFW Q4.65 R236.28HA3 END FARE USD 477.21 TAX 35.79US 6.00XF 5.00ZP TOT USD 524.00' ca = 2-CHARACTER CARRIER CODE FOR AIRLINE ARG: L[1] - MATRIX OF CITIES FROM THE ITINERARY L[2] - CARRIER CODES (MAT) TO BE EXPECTING L[3] - NUMBER OF SEGMENTS IN ITINERARY

	L[4] - CHAR VERSION OF BASE FARE (IF SUPPLIED) R - CHAR VEC OF LINEAR TO ANALIZE RESULT: Z[1 THRU 3] - BOARD CITY Z[4 THRU 6] - OFF CITY Z[7 THRU 13] - FARE Z[14 THRU 17] - ZP Z[18 THRU 21] - XF Z[22 THRU ?] - FARE BASIS

RECORD_TKTS	RECORD TICKET NUMBERS FOR LATER CHECKING OF DUPLICATES ARG: R - LIST OF TICKET NUMBER RESULT: 1=TICKET HAS BEEN USED BEFORE
RIP_OUT_ADDRESS	GET THE ADDRESS (IF THERE) FROM A PNR ARG: R - PNR TO LOOK IN RESULT: CHAR MATRIX OF ADDRESS (OR EMPTY)
RIP_OUT_FFN	GET FREQUENT FLYER NUMBERS OUT OF A SABRE RECORD ARG: R - R TO WORK ON L - LIST OF NAMES FROM THE R RESULT: MATRIX OF FFN CORRESPONDING TO NAMES(OR BLANK)
RUN_CONT_SCHED	RUN A CONTINUOUS PROCESS IN THE SCHEDULER. ARG: R[1] - WHICH CONTINUOUS PROCESS (1-N) R[2] - WHERE IN Sched TO GET RUNNING PARMS
RUN_SCHED	RUN SCHEDULED EVENTS
RUN_TP_SCHED	RUN A TIMED PROCESS IN THE SCHEDULER. ARG: R[1] - WHICH TIMED PROCESS (1-N) R[2] - WHERE IN Sched TO GET RUNNING PARMS R[3] - WHERE TO STORE STATUS
SET*STUFF	SET STUFF. ARG: R - 1=DO FULL RESET OF PNR PROCESSING VARS
SET_CONT_SCHED	SET THE SCHEDULED TIMES FOR 1 CONTINUOUS PROCESS. ARG: R - CHAR STRING OF WHICH PROCESS FROM THE INI FILE (CPROCESS1)
SET_KAFON	CREATE THE LIST OF FLIGHTS IN THEIR SYSTEM.

SET_LINEAR_VARS	SET A BUNCH OF VARIABLES THAT COME FROM THE LINEAR ARG: R[1]-LINEAR R[2]-GROSS AMOUNT FOR TICKET R[3]- NUMBER OF PARTY L-ORIG,DEST RESULT: RC,BUNCH OF VARS
SET_TP_SCHED	SET THE SCHEDULED TIMES FOR 1 TIMED PROCESS. ARG: R[1] WHERE IN LOAD_DAILY TO GET STATUS INDICATOR R[2] HHMM - CURRENT TIME TO COMPARE AGAINST L - CHAR STRING OF WHICH PROCESS FROM THE INI FILE (TPROCESS1-)
SIGNIN*TAS	ASYNC LOGIN TO MULTIPLE TAS ARG: R - WHICH TAS HANDLES TO SEND TO RESULT: BOOLEAN INDICATING WHICH TA SIGNED IN OK (=1) ALL BUT THE LAST TA SIGNS ON THE SAME
SOCKET_CHECK-IN	Checks in with SOCKET_CHECK_IN_SERVER running on the monitor robot. ARG: R[1] - ROBOT NAME R[2] - COMPUTERNAME:IP R[4] - TIMESTAMP
STORE*DAILY	STORE DAILY INFORMATION. ARG: L - DATA TO STORE R[1] - DATE TO STORE UNDER R[2] - CMP OF FILE
STORE*DAILY*DIFF	STORE DAILY NUMERIC INFORMATION. IF THE NUMBER HAS CHANGED (I.E. SOMEONE ELSE ALSO STORING) THEN ADD IN THE INCREMENTAL CHANGES. ARG: L - DATA TO STORE L[1] - ENDING COUNTS L[2] - BEGINNING COUNTS L[3] - ENDING COUNTS (MIRROR COUNTER) ONLY NECESSARY IF USING COMPONENT 9 L[4] - BEGINNING COUNTS (MIRROR COUNTER) ONLY NECESSARY IF USING COMPONENT 9 R[1] - DATE TO STORE UNDER R[2] - CMP OF FILE RESULT: Z - TOTAL COUNTS (IN THE CASE THAT THE COMPONENT IS 9 (COUNTERS) THEN THE RESULTS FOR THE MIRROR COUNTERS WILL BE RETURNED AS WELL - ρZ WILL BE 2 INSTEAD OF 1.

TOP_OF_DAY (custom coded for each customer) (Cprocess)	RUN AT THE START OF DAY FOR - (2-Character Carrier Code)
TTL*CAN	RETRIEVE TICKET TIME LIMIT INFORMATION ARG: R - PNR TO CHECK L - 1=ONLY LOOK REMARKS SECTION Z - [1] 0=NO TTL 1=IS TTL 2=IS ROBOT TTL [2] 0=DEADLINE TYPE TTL OR NEED TO SKIP N=TIME LIMIT [3] 0=SUPERVISOR OVERRIDE; OTHERWISE REMARK LINE NUMBERS CONTAINING ROBOT TTL
XLS_TO_TXT	Converts an Excel Spreadsheet into a text file of the same name in the same location. ARG: R - PATH TO EXCEL FILE RESULT: Z - FULL PATH TO FILE CREATED

With reference to Figures 13 and 14, a robotic application conveniently referred to as Troll checks for suspicious names in order to remove invalid reservations from the reservations system.

Referring particularly to Figure 18, functionality is noted for determining whether a ticket number is associated with a given PNR. Figure 19 provides functionality for checking for duplicate ticket numbers while Figure 20 provides functionality for checking PNRs for expired TTLs. Figure 24 provides functionality for building a database of canceled PNRs while Figure 25 provides top of the day routines. Figures 26 through 28 provide functionality for PNR scraping, that is, the removal of a PNR from a reservations system.

For convenience in understanding the relationship of the various drawings, Table XIV is provided:

TABLE XIV

FIGURE TITLES AND INTER-FIGURE LINKS

FIG	Title	Links In	Links Out
4	Robot Startup		FIG 4-6 FIG 4-5
5	Scheduling	FIG 4-5	
6	Running	FIG 4-6	
7	Preparing to Obtain PNRs		
8	Obtaining PNRs	FIG 20-8	FIG 8-9
9	Identifying New PNRs	FIG 8-9	FIG 9-20 FIG 9-10
10	SWEEPER (1st-Round Flight Firming) * Part 1 of 3 *	FIG 9-10	FIG 10-13 FIG 10-15 FIG 10-26 FIG 10-18 FIG 10-18 FIG 10-11 FIG 10-18 FIG 10-11
11	SWEEPER (1st-Round Flight Firming) * Part 2 of 3 *	FIG 10-11 FIG 10-11	FIG 11-13
12	SWEEPER (1st-Round Flight Firming) * Part 3 of 3 *	FIG 11-12	
13	TROLL (Check for Suspicious Names) * Part 1 of 2 *	FIG 10-13	
14	TROLL (Check for Suspicious Names) * Part 2 of 2 *		
15	DUPE SNOOPER (Duplicate Segment Processing) * Part 1 of 3 *	FIG 10-15	FIG 15-16
16	DUPE SNOOPER (Duplicate Segment Processing) * Part 2 of 3 *	FIG 15-16	FIG 16-17 FIG 16-17
17	DUPE SNOOPER (Duplicate Segment Processing) * Part 3 of 3 *	FIG 16-17 FIG 16-17	
18	Is There a Ticket Number on the PNR?	FIG 10-18 FIG 22-18 FIG 10-18	FIG 18-19
19	Checking for Duplicate Ticket Numbers	FIG 18-19 FIG 10-19 FIG 22-19	
20	Checking PNRs for Expired TTLs	FIG 9-20	FIG 20-8

FIG	Title	Links In	Links Out
21	ENFORCER (2nd-Round Flight Firming) * Part 1 of 3 *	FIG 22-21	FIG 21-22 FIG 21-23
22	ENFORCER (2nd-Round Flight Firming) * Part 2 of 3 *	FIG 21-22	FIG 22-18 FIG 22-19 FIG 22-21
23	ENFORCER (2nd-Round Flight Firming) * Part 3 of 3 *	FIG 21-23	
24	Building Database of Canceled PNRs		
25	Top-of-Day Routines		
26	PNR Scraping * Part 1 of 3 *	FIG 10-26	FIG 26-27
27	PNR Scraping * Part 2 of 3 *	FIG 26-27	FIG 27-28
28	PNR Scraping * Part 3 of 3 *	FIG 27-28	
2	Data Flow		
3	Sequences of Operations Involving Queues		

A process figure list is provided is provided in Table XV to reference processes to figure numbers.

TABLE XV

PROCESS FIGURE LIST

Process	FIG #
ADD_CANCELS_TO_DB	24
ADD_ITIN_FROM_HIST	26
ADD_TO_ITIN	26
AddCancelsToDB	See ADD_CANCELS_TO_DB
BUILD_1D_FLIGHT_LST	7
BUILD_SCRAPE_REC	28
CHASE_DIVIDED	27
CHECK_SUSPICIOUS_NAMES	13
CHECK_TICKETED	
CHG*VALPNR	11
DO*ET*ER	11
DO*QEP	11
EMAIL_SUSPICIOUS_NAMES	14
EXCEL_REPORT	
EXPAND_ITIN_N7	26
FIRM_RULES1 (custom coded for each customer)	11,21
FLOWN_DATA	26,27,28
FLOWN_FF_TABLE2	28
FLOWN_FP_TABLE2	28
GATHER_PNRCTR	
GET_ATN_TKT	18
GET_EXPIRING_TTLS	20
GET_FIRST_PNR_DATE	26
GET_NAMES3	13,26
GET_OSITKT	18
GET_SECTION	27
GET_ticket	18
GET_TICKETS	27
GET_TOURAMT	28
HANDLE_DUP_TKT	19
INIT	4
INIT2	4
INIT3	4
IS_IT_TICKETED	18
KILL*PNR	21
KILL_DUP_SEGMENTS	15,16,17
KILL_PNR_SUB1	23
KILL_PNR_SUB2	21
KILL_PNR_SUB3	22

Process	FIG #
LOAD*DAILY	4
LOAD_SCHED	5
LOG_VALTKT	19
MAIN	4
MAIN_SR	4
PROC*PNR*STUB	12
PROC_BUILD_LDS	7
PROC_FIRST_ROUND	9
PROC_PNR	10,11
PROC_RUN_LDS	8
PROC_SCHED_LDS	7
PROC_SECOND_ROUND	21
PROC_TRAFFIC_COP	8,9,11,20
PULL_ITIN	26
PULL_SABRE_WP	27
PULL_TICKETS	18
READ_PNR	9,21
READ_SABRE_LINEAR	28
RECORD_TKTS	18
RIP_OUT_ADDRESS	27
RIP_OUT_FFN	27
RUN_CONT_SCHED	6
RUN_SCHED	6
RUN_TP_SCHED	6
SET*STUFF	4
SET_CONT_SCHED	5
SET_KAFON	4
SET_LINEAR_VARS	28
SET_TP_SCHED	5
SIGNIN*TAS	4
SOCKET_CHECK-IN	
STORE*DAILY	6
STORE*DAILY*DIFF	6
TOP_OF_DAY (custom coded for each customer)	25
TTL*CAN	21

After a PNR image has been obtained as aforesaid, certain techniques are used in the code to retrieve desired information. Since a wide variation can exist in the appearance of one PNR as compared to another, most of the following parsing techniques have been empirically developed. In general, a function will scan a PNR image and look for something unique such as keywords or positions in order to identify a section of the PNR. Table XVI provides examples of keywords.

TABLE XVI

Keywords	Meaning
#.#	Identifies a passenger name
# flight date board off	Identifies the pattern for an itinerary
CHECK,CK CASH, CK CC	Keywords for forms of payment
FREQUENT TRAV	Keywords for frequent-traveler section (Sabre)

Table XVII provides examples of positions and keywords.

TABLE XVII

Examples of Positions and Keywords

Section names that could directly follow the itinerary section	**Keywords For Phone-Number Section**	**Keywords For Form-Of-Payment Section**	**CRS / GDS**
BAGGAGE VCR COUP GENERAL TICKETIN TKT/TIME REMARKS PHONES SEATS/BO RECEIVED FARE – P FREQUENT *ca* FACTS (where *ca* is Carrier Code)	PHONES	REMARKS	SABRE, SABRESTIN
FONE- TKT-T GEN FAX- TLT-	FONE-		SHARES
FONE- ***	FONE-	FOP:-	APOLLO
AP TK SSR	AP	FP	AMADEUS
P- 1 T- 1 A-1.	P- 1	FOP-	WORLDSPAN
HA FAX- FONE- RMKS- TKT-	FONE-		DELTAMATIC

When the desired section has been found, information in the section is then utilized or processed as required such as via the following processing steps:

1) Find PNR by passenger name
2) Obtain record locator for PNR
3) Log the information
4) Use fax number or email address to send a message
5) Process information in the PNR by IATA
6) Evaluate frequent-flyer information
7) Check for existence of ticket numbers for TTL assignments
8) Check for duplicate ticket numbers
9) Check for valid passenger names (lastname/firstname or initial)
10) Check for fictitious passenger names
11) Match PNRs for TTR processing
12) Evaluate booking source (do not assign TTL to host-generated booking)
13) Evaluate itinerary for TTL assignments
14) Evaluate linear for pricing information (this is the only place that price-per-segment information can be found)

A PNR example is particularly provided in Table XVIII:

TABLE XVIII

PNR Example

Contents of PNR	Entries	Explanation
1P- 2L4OI3	1P- 2L4OI3	GDS code (Worldspan) PNL (Record locator)
1.1DASH/MEENAKSHI@*ADT	1.1 DASH /MEENAKSHI @*ADT	Group#.Person# Passenger last name /First name ?
1 N7 100H 18APR T MDWLAS HK1 815A 1015A/O A	1 N7 100 H 18APR T MDWLAS HK 1 815A 1015A /O A	First leg Carrier (National) Flight number Class Day Month Day of week (Tuesday) Market Status (Holding confirmed) Total in party Departure time (8:15 AM) Arrival time (10:15 AM) ?
2 N7 306B 20APR T LASMDW HK1 330P 905P/O A	2 N7 306 B 20APR T LASMDW HK 1 330P 905P /O A	Second leg Carrier (National) Flight number Class Day Month Day of week (Tuesday) Market Status (Holding confirmed) Total in party Departure time (3:30 PM) Arrival time (9:05 PM) ?
3 TVL ZZ MK1 MI 0OCT00/AN-THANK YOU FOR CHOOSING CINTAS TRAVEL		
P- 1.7JX513-573-4153-FAX		New Section—Phone (fax)
2.7JXVERIFY SPELLING OF NAME************************		
T- 1.TAW/62/13APR//OK.TKTLESS		New Section—Ticket Information
A-CA300100		New Section
A-CM5*$C50.00		
A-1.CB CINTAS*DEL.DATE		
2.CB PERSON WHO MADE RES AND LOCATION		
1.CD CINTAS CORPORATION		
2.CD 6800 CINTAS BLVD		
3.CD CINCINNATI OHIO 45262-5737		
TKG FAX-AUTO PRICED FARE TYPE EX		New Section—Ticketing Facts

Contents of PNR	Entries	Explanation
FQ- 4PQ		New Section—Fare Quote
FARE QUOTED 13APR BY AGT-40/7JX		
ADT CHI N7 LAS 238.14N7 CHI 284.65USD522.79END N7 ZPMDWLAS XF MDW3LAS3 BF-522.79 TX-50.21 TTL-573.00 HA3*B TOTAL BF-522.79 TX-50.21 TTL-573.00 USD		Linear
*** DI ITEMS EXIST ***		
FOP- 1.CCAX37nnnnnnnn11777		New Section—Form of Payment (Credit Card)
2. /EXP12-02		(Expiration date)
G- 1.OSI YY CVG CONTACT 513-573-4034 HEIDI MARIE OR MARY	OSI	New Section—General Other Special Instructions
2.SSRADTK1PPLZ SEND TKT NO IN OSI/SSR FIELD BY 1700/17APR PST		Robot-generated message to travel agent
M- 1./CINTAS CORPORATION		New Section
2./6800 CINTAS BLVD		
3./CINCINNATI OH 45262		
8.DK/DP301		
9.MK-01		
11.DK/AS94		
13.DK/FF763.00*A/LF573.00		
**** ITEMS SUPPRESSED ****/CN/ML/U/EDT/QF/DR		

Table XIX further provides a linear example of a round trip of a typical type.

TABLE XIX

Linear Example

Round trip—Los Angeles (LAX) to Las Vegas (LAS) and return

Linear:	LAX N7 LAS R32.50KR7NR/CD N7 LAX R32.50KR7NR/CD END FARE USD 65.00 TAX 6.00XF 5.20US 4.00ZP TOT USD 80.20
Code:	**Meaning:**
LAX	Board City
N7	Carrier for first segment
LAS	Off City; Board City
R32.50	Fare for first segment
KR7NR/CD	Fare Basis with Discount
N7	Carrier for second segment
LAX	Off City
R32.50	Fare for second segment
KR7NR/CD	Fare Basis with Discount
END	End of fare calculation
FARE USD	Fare is in US Dollars
65.00	Total Fare
TAX	Tax
6.00	Amount of tax ($6.00)
XF	Fee
5.20	Amount of XF fee ($5.20)
US	Fee
4.00	Amount of US fee ($4.00)
ZP	Fee (none charged)
TOT USD	Total is in US Dollars
80.20	Total Fare (including fees)

As indicated hereinabove, the following Table provides terms and abbreviations which facilitate an understanding of the invention:

TABLE XX

Airline Industry: Terms and Abbreviations

A	
ACT	Actuals capacity
Actuals	Number of passengers who were on a flight
AD	Advanced Departure (leg is next day after trip starts)
ADT	Auditor
ADTK	Advise ticket number (request for TKNN)
ARC	Travel agent's ID code (U.S.)
ARNK	Arrival Unknown (how passenger got to the flight is not known)
Arr	Arrival time
ATAC	Automated Ticket Agent Checkout; Sabre report of day's activity of each employee
ATN	Automatic Ticket Notification (from GDS to CRS when travel agent issues ticket)
AUT	Authorized capacity
B	
Board	City where passenger gets on board aircraft
C	
C20	Sabre report showing which employees were active on a given day for a given station #
CA	Cash payment
CC	Credit Card payment
CK	Check payment
Class	Level of luxury of flight accommodations
Confo	Confirmation
CPN	Coupon
CRS	Central Reservation System (for airlines)
D	
Dept	Departure time
Direct Market	Non-stop flight
E	
E-Tkt	E-ticket (electronic ticket)
F	
FFS	Frequent Flyer System for National (points for $, not miles—unlike most others)
FLN	Flown
Flt	Flight
FOP	Form of Payment
G	
GDS	Global Distribution System (for travel agents)
GMT	Greenwich Mean Time (Coordinated Universal Time; Zulu time)
Go-show	Passenger who shows up to board with a reservation but no ticket
Group	Parties of (usually) 10 or more on a PNR
H	
HA	Host Airline
HL	On wait list
HK	Holding confirmed reservation
Host	The airline issuing the ticket
I	
IATA	Travel agent's ID code (international)
Indirect Market	Flight with intermediate stops
J, K, L	
LD	List Display (display a PNR)
Leg	The part of a flight between stops (term used by operations; also see Segment)

Linear	Info on a ticket that shows the flow of the flight, start to end, with pricing and fees
M	
MKT	Market (board city/off city) (Example: LASLAX = Las Vegas / Los Angeles)
MM	Meal Moocher (employee: free ticket)
N	
NFL	New (schedule change)
NN	Need seat(s)
No-show	Passenger who has a ticket but fails to show up
NON-REV	Non Revenue (free ticket)
O	
O&D	Origin and Destination (complete itinerary)
OA	Other Airline
Off	City where passenger gets off aircraft
OSI	Other Special Instructions
OTHS	Others ????????????????
OW	????
P	
Passive	????
PAX	Passenger
PDC	Post-Departure Checkout
PK	Passive booking (???????????
PNL	PNR Record locator (6 characters)
PNR	Passenger Name Record
PTC	Passenger Type Code
Q	
Queue	A location on a CRS or GDS for data to be stored
QR	????
R	
RT	????
S	
Segment	The part of a flight between stops (term used by planners/schedulers; also see Leg)
Skd	Schedule
SSR	Special Service Request
T	
TA	Travel Agent; Ticket Agent; Terminal Address
TBM	Ticket by Mail
TD	Table Driven (no fare info available—default table used as source for fare info)
TKNN ###. . .	Ticket number is ############# (response to ADTK)
TKNO	Ticket Number
Tkt	Ticket
TOD	Ticket on Departure (?????????
TTL	Ticket Time Limit (based on time zone of a city—usually airline's home base)
TTR	Teletype Reject (problem with communication between GDS and CRS)
U	
UC	Unavailable
UFL	Update (schedule change)
UN	Unavailable
UTC	Coordinated Universal Time (Greenwich Mean Time; Zulu time)
V	
VCR	Virtual Coupon Record (an e-ticket)
VIPC	Advanced booking data (?)
W, X, Y, Z	
WP	Will you Price(?)

XFL	Cancel (schedule change)
XLD	Cancelled
ZFL	Equipment or time (schedule change)

Airline Automation, Inc.

AAI	Airline Automation, Inc.
APARS™	Automated Postal Air-Res System
CMP	Component (In a *.sf file, a "drawer" that can contain anything)
CPN	Coupon; Coupon file (*.cpn)
Cprocess	Continuous process (cooperative process)
CSV	Comma Separated Variables file (*.csv) (for spreadsheet compatibility)
C/Y	Current Year (may be defined several ways, as appropriate)
Dupe Snooper	A service of AAI that searches for duplicate bookings and process them according to customer's rules
EDI	Electronic Data Interchange (used in APARS)
Enforcer	The second round of Flight Firming. Processes PNRs with expired TTLs but no tickets, as per the customer's rules (cancel, warn again, ignore, etc.)
ERR	Error; Error file (*.err)
ETKT	E-ticket (electronic ticket)
Flight Firming	A service of AAI that enforces an airline carrier's ticketing time limits (TTL's)
FLN	Flown file (*.fln)
FTP	File Transfer Protocol (used when transferring files over the Internet)
FTS™	Frequent Traveler System
FSAS™	Flight Schedule Automation System
HLD	Hold file (*.hld) (for file locking)
INI	Initialization file (*.ini)
Ign, Ignr	Ignore
LAN	Local Area Network
LOG	Log file (*.log)
MBS	Access Database file (*.mbs)
NPC	National Processing Company (processes commission payments to TAs); NPC file (*.npc)
OSG	Open Systems Gateway (Sabre Gateway for NT)
OSP	Open Systems Platform (Sabre communications infrastructure)
OUT	Out file (*.out) (for NPCs)
PARM	Parameter (used to pass a value from INI file to a process)
PDC	Pdc file (*.pdc) ????????????
PK	Passive Booking
Predator™	Family of AAI's modules and robotic applications
PRN	Print file (*.prn)
PUR	Pur file (*.pur) ???????????
P/Y	Prior Year (may be defined several ways, as appropriate)
Q	Queue
Queue	A pair of files, one of which contains items to be worked, the other contains tracking information about the items
RPT	Report; Report file (*.rpt)
SAFIRE™	System Automation for Intelligent Rate Efficiency
Scraping	A service of AAI that reproduces a PNR in a standard format from historical and other information associated with the PNR over its lifetime. The term "scraping" comes from the concept of obtaining an image of the PNR as scraped off the screen on which it is displayed.
SF	An APL file (*.sf) "cabinet" whose "drawers" are called "components"

Sweeper	The first round of Flight Firming. Determines if new PNRs need a TTL set; if so, sets a TTL and informs the booking agent that a ticket is needed before the TTL expires
Tie	To open a file for use ("exclusive tie"—file is unavailable to any other process; "share tie"—file may be accessed on a limited basis by other processes)
TBR	Ticket by Robot
TMS™	Tour Management System
Tprocess	Timed process (runs at specific times of day)
Troll	A service of AAI that searches for suspicious names in PNRs processed by Sweeper, and alerts the customer by email
TXT	Text file (*.txt)
UNB	Unb file (*.unb) ?????????????
VCR	Virtual Coupon Record (an e-ticket); Vcr file (*.vcr)
W3	APL code file (*.w3)
WAN	Wide Area Network

Time Zones:

US1	EST / EDT	Eastern Standard / Daylight Time
US2	CST / CDT	Central Standard / Daylight Time
US3	MST / MDT	Mountain Standard / Daylight Time
US3A	MST (no daylight saving)	Arizona (also robot time)
US4	PST / PDT	Pacific Standard / Daylight Time

Days of the Week:

Airlines		
1	M	Monday
2	T	Tuesday
3	W	Wednesday
4	Q	Thursday
5	F	Friday
6	J	Saturday
7	S	Sunday
AAI's APL code		
0		Monday
1		Tuesday
2		Wednesday
3		Thursday
4		Friday
5		Saturday
6		Sunday

GDS/CRS Codes:

GDS	
1A	Amadeus
1V	Apollo
1G	Galileo
1S	System One
1P	Worldspan
SA	SabreSTIN (Sabre Travel Information Network)
CRS	
AA (SAB)	Sabre (OSG1: 56K) (OSG2: 256K) (OSG3: 256K)
	Mexicana Centauro EDS Shares
SHR	Shares
MAR	Marsha
DLT	Deltamatic
MBB	Magic Black Box

Commands:

Signout	
SO	Sabre, SabreSTIN
BSO	Shares
SOF	Apollo
JO	Amadeus
DSO	Deltamatic
Other	
AAA *xxx*	Change sign-in location of terminal to *xxx* (where *xxx* = HDQ, XTM, citycode, pseudo city code, etc.)
Codes	
HDQ	Headquarters (location of terminal for most communications)
XTM	Centralized Ticket by Mail—Texas (location of terminal for ticket by mail)

Airline Carrier Codes:

6Y	Nica (Grupo Taca)
AA	American Airlines (includes: Aadom, Aaeuro, Aajpn, Aalary, Aalat, Aamex, Aatar, Aauk, Aausa)
AR	Aerolinas Argentina
AS	Alaska
BD	British Midlands
BW	BWIA (British West Indies)
CM	COPA
DL	Delta
FF	Tower
GU	Aviateca (Grupo Taca)
HA	Hawaiian
JI	Midway
KP	Kiwi
LR	LACSA (Grupo Taca)
MX	Mexicana
N7	National
QQ	Reno
TA	Taca (Grupo Taca)
TZ	American Trans Air (ATA)
WN	Southwest Airlines
YX	Midwest Express
YY	All carriers (used in messages)

Although the present method and system have been particularly described relative to flight firming processes, it is to be understood that the invention could be configured to provide other services of a similar nature. Within flight firming itself, it is to be understood that certain functionalities can be practiced other than as explicitly described herein. Still further, certain functionalities can be dropped from the methodology altogether, one example being the traffic cop function referred to herein. A system without such a function would simply look at all PNRs rather than only new PNRs. Such a system would require a greater amount of time for processing all PNRs within a reservations system. However, the intended function could be provided. Accordingly, it is to be understood that the scope of the invention is not to be limited by the description of a particular embodiment of the invention but is to be limited only by the recitations of the appended claims.